Universidade de Aveiro Departamento de Comunicação e Arte

2011

João José do Vale Afonso

Creating a dynamic music artist profile supported by waves of mashups

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Dissertação apresentada à Universidade de Aveiro para cumprimento dos requisitos necessários à obtenção do grau de Mestre em Comunicação Multimédia, realizada sob a orientação científica do Doutor Pedro Alexandre Ferreira Santos Almeida, Professor Auxiliar Convidado do Departamento de Comunicação e Arte da Universidade de Aveiro e co-orientação científica do Doutor Luís Francisco Gabriel Mendes Pedro, Professor Auxiliar do Departamento de Comunicação e Arte da Universidade de Aveiro.

Dedico este trabalho a toda a minha família em especial à Ana pelo apoio e à Leonor pela inspiração.

Dedico-o igualmente a todos os que acreditaram. Uma palavra de incentivo faz muitas vezes a diferença entre uma ideia numa gaveta e um projecto com sucesso.

I dedicate this work to my family, especially to Ana for her support and to Leonor for her inspiration.

Also to everyone that believed. A word of incentive can sometimes be difference between an idea locked away and successful project.

o júri

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Por último, agradeço a todos os que acreditaram. Uma palavra de incentivo faz muitas vezes a diferença entre uma ideia numa gaveta e um projecto de sucesso.

palavras-chave

Mashup, música, perfil de utilizador, conteúdos gerados pelo utilizador, web services

resumo

O advento da Internet provocou alterações em diversas áreas da sociedade entre as quais a industria musical. Neste campo, essas mudanças levaram a que todo um modelo de negócio tenha agora de ser repensado. As editoras parecem estar a perder o controlo sobre a partilha dos conteúdos mas também sobre a própria promoção de artistas e obras. Hoje em dia qualquer pessoa pode ser um critico de música e exercer influencia dentro das suas redes sociais.

É neste contexto que surge o Urock, uma aplicação multiplataformas para a partilha e transmissão de conteúdos musicais que permite aproximação entre artista e público. A especificação deste projecto levantou várias questões, entre as quais como atrair novos utilizadores e lidar com a quantidade de informação e conteúdos que estes têm dispersos na rede. O advento da tecnologia de mashups poderá ser a resposta a este problema. O utilizador comum tem, normalmente, a sua informação mais concentrada num local da rede e controlo sobre os seus conteúdos. No entanto, o utilizador artista pode ter a sua informação dispersa por vários locais na rede e pode não ter controlo sobre os conteúdos que lhe dizem respeito. Por esse motivo, a presente investigação procura identificar quais os web services necessários para criar perfil de artista dinâmico. Na impossibilidade de desenvolver a aplicação Urock, foi conceptualizado e implementado um subproduto, o Musikki. Esta aplicação permitiu efectuar um estudo de caso que possibilitou avaliar um modelo de mashups proposto como hipótese de trabalho.

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keywords mashup, music, user profile, user-generated content, web services

abstract

The advent of Internet introduced changes in several areas of society and the music industry is no exception. These changes are forcing to a redefinition of the industry's business model. Record labels seem to be losing their control over how music content is shared and even how the promotion of artists and works are made. Nowadays, anyone can be a music critic and influence their network friends on what music to listen to.

It is in this context that the Urock project appears, a user-generated content cross-platform application specially oriented for publishing and broadcasting musical content. Its main objective is to help new or established artists to promote their work, creating a bidirectional communication channel between artists and audience. The specification of this project raised several issues, like how to attract new users and how to deal with the information and content they have scattered all over the Internet. The advent of mashup technology might be the solution to this problem. Typically, common users have their information concentrated in one or two locations and total control over their media content. However, the user artist might have his information and content stored in different locations and might not have full control over all their content. For this reason, this research aims to identify which web services can be combined to create a dynamic user profile.

Due to time restrictions it was impossible to develop the Urock application. For this reason, Musikki, an Urock sub product, was conceptualized and developed. This application allowed the evaluation, by means of a case study, of the mashup model proposed as a working hypothesis.

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1 Introduction

1.1 Research context

This research continues the work of the Urock Project[1] started on the first year of the Multimedia Communication MsC. Urock[2] is a user-generated content cross-platform application specially oriented for publishing and broadcasting musical content. Its main objective is to help new or established artists to promote their work, creating a bidirectional communication channel between artists and audience. Urock is also a social network and it is argued that, if the proper functionalities are available, the online community can play an important role on promoting their favourite artists.

With the diversity of social networks existing today, it can be quite difficult to attract new users. The main obstacles could be the reluctance of users to abandon a community they belong to and the time required to creating another profile with exactly the same information they have on other networks. This problem might affect Urock users' profiles, fans and artists, and it is an issue that deserves a comprehensive study.

[1] See http://www.vimeo.com/5550008
[2] See http://www.urockstage.com/

1.2 Research Question

The state of the art research for the Urock project already provided a possible technical solution for the information and content redundancy problem: the adoption of mashups[3]. The most notable social networks and user-generated content applications such as Facebook[4], Twitter[5], MySpace[6], Last.fm[7], Wikipedia[8] or YouTube[9] place, at the developers' disposal, web services that allow other applications to retrieve and submit information to their systems. Using this technology, users can register, synchronize and share information seamlessly through different websites without redundant data. Besides the obvious advantages of time, data and resources saving, this solution presents another great opportunity. Not only can users share information within Urock's community but they can also spread information to nearby networks, which might increase the potential target audience.

Consequently, the team has decided to develop the application using mashup technologies. Despite this decision there are still several issues that need to be addressed. Urock's main content is music related, so it is mandatory to determine which web services are most suitable for this kind of content and what is the relevant information to retrieve and submit to those web services. Another important outcome from such a study might be to understand if data from different sources (web services) can be integrated to generate new functionalities, in a different way from what they were intended to.

The above reflection can be synthetize in one unique research question:

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[3] See http://en.wikipedia.org/wiki/Mashup_%28web_application_hybrid%29
[4] See http://www.facebook.com
[5] See http://twitter.com
[6] See http://www.myspace.com
[7] See http://www.lastfm.com
[8] See http://www.wikipedia.com
[9] See http://www.youtube.com

Which are the preferable web services to build a user-generated music artist profile mashup?

1.3 Research aim and objectives

This research aims to propose a possible system to create a user-generated music artist profile. A solution that could help, this type of users, to deal with the redundancy of information and dispersed media content, existent on the Internet.

General Objectives:

- Propose a mashup model to support a dynamic user-generated profile (musician/band);
- Develop a prototype to test the given hypothesis (i.e. mashup model);
- Evaluate the mashup model efficiency by using the developed prototype as a case study;
- Propose a new version of the model based on the study conclusions (if applicable).

Specific Objectives:

- Identify the required fields to include on a music artist profile;
- Identify the required functionalities to include on music artist profile;
- Specify the right API for each field;
- Specify a layout and navigational structure that can cope with different types and volumes of content in the minimum pages possible;
- Propose an integration of this model on the Urock application.

1.4 Research Method

The author has a predefined theory of a mashup model, which will be used as a working hypothesis and tested by means of a case study. First, an exploratory approach is mandatory to consolidate the knowledge in this area of expertise that can help to fundament the options made when the mashups model is concerned.

The mashup model will be tested in a music search engine, Musikki[10]. This web-based application, conceptualized and developed by the researcher, will allow the evaluation of the referred model. The application will be launched in November 2010 and monitored for a period of two months recurring to Google Analytics[11] tool to register the usage data. During that period, the author will use social media to promote the online application in order to gather as much users as possible. At the end of the evaluation period, social media will again be used to share an online questionnaire with two main objectives: i) validate the model – understand if the proposed mashup profile satisfies the user needs when it comes to music artist related information; ii) evaluate the acceptance of the mashup model concept – anticipating the fact that some of the participants may have never used Musikki, part of the questionnaire aims to evaluate if they would use such a concept and what type of content would they require.

The data will be analysed according to a quantity criteria, determining, for example, the preferable source of music information by the one that is used the most. At the end, the analysis of these results will hopefully provide enough indicators to validate or reformulate the mashup model.

1.5 Personal Motivations and Research Relevance

The author is aware of the effort and dedication it is required to conduct a scientific research and that motivation might present as a key factor throughout the study. For this reason, to work in an area of personal interest seems as a good option. As

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[10] See http://www.musikki.com
[11] See http:// www.google.com/analytics

a music enthusiast and follower he identified a confluence of changes on economical, technological and cultural aspects of the music context that present as a great opportunity of study in this area of expertise.

Music industry is said to be in crisis for the past decade. Album sales have been steadily dropping for the past 10 years with a slight comeback in 2008 mainly due to mp3 download and vinyl sales increase. While market rules are changing, mainly due to technology innovation and consequent change of consuming habits it introduces, the industry seems to be failing to adapt itself to those changes (Wendel, E., 2008). New technologies could create new needs in the consumers and the industry, and society itself, should try to fulfil those needs.

With this research, the author aims to make a small contribution in this domain, by proposing a possible solution to the already mentioned information redundancy and content dispersion issues.

1.6 Document Structure

After a brief introduction on the research subject and question, a literature revision is presented that addresses the following domains: i) music – a contextualization of the music industry and the changes it is being submitted to and state of the art of music applications ii) Web – a reflection on what is changing on the web and what it might become in the future; a state of the art of social media iii) mashups – a definition of the concept and a comprehensive state of the art analysis.

In the third chapter, *Empirical Research*, the mashup model that serves as working hypothesis is explained and the application on which it will be tested is presented. The development, design, promotional and business model are also addressed.

The questionnaire and analytics data are analysed and presented on the fourth chapter, *Data Analysis and Presentation.* Based on this analysis a new version of the mashup model is proposed on chapter five, *Reviewed Model*, along with interface design, interaction, system performance and functionalities improvements. A possible application of this model on the Urock application is also addressed.

This documents ends with the Conclusions chapter, where the author reflects on the study results, refers to the research limitations and points out future work possibilities.

2 Theoretical Framework

2.1 Music Industry

In the year 2000, the band Pearl Jam sent a message to the music industry. When everyone was trying to fight record piracy and the proliferation of live bootleg albums, they launched the Bootleg Series (Wendel, E., 2008). A record for each and every show of their US and European tour at a low sale price. After the huge success of 2000's tours, they set a record for most albums to debut in the *Billboard* 200 simultaneously (Wendel, E., 2008), the band continued the bootleg program and in the 2005 tour the shows were available for download, just two or three days after the concert took place, through the band's website.

Instead of persecuting the fans that were selling and buying the bootlegs they understood that a new need and demand was created and decided to fulfil that need and generate extra value from their work. They also understood that the listening habits were changing. People now listen to music on their iPods and on their computers while they work, study or surf the web (Tappscott, T., 2008) and they are not willing to wait for it to reach the shelves of the traditional music stores, they want to listen to it immediately and wherever they want, with no restrictions (no DRM) (Wendel, E., 2008).

By reacting accordingly to this cultural shift, Pearl Jam went from the possibility of spending millions of dollars in lawsuits (Wendel, E., 2008) to selling 3.5 millions official bootleg albums from 2000 to 2008, according to the band's website[12].

The industry continued to spend millions in anti-piracy software and lawsuits against illegal download websites (Wendel, E., 2008). In the last couple of years, other successful examples of generating revenues using the existing technology

[12] See http://www.pearljam.com/

have emerged and industry seems now opened to discuss and implement a new business model (Anderson, C., 2009).

The new business model is not yet defined but we can already have a perspective on what can be used to monetize it and especially who will be the centre of it, the consumer. We must first acknowledge that record labels based their income on recording and selling album copies, and that model appears to be no longer profitable. The existing business model seems to be deprecated and labels should try to find different ways to generate revenues.

2.1.1 Consumer-led

There was a time when record companies determined what we would listen to. Their album release strategies were simple, they chose the singles, promoted them on the radios, TV and press and waited that promotion on the media would reflect on the album sales. Everything seamed controlled; our choice was limited to a set of artists determined by them. Then the Internet came and information became available to everyone. People could now search for different kinds of music and discover new artists at a click of a button.

Although this new source of information has been available for some time, in the author's opinion it was only with the advent of social networks that the power to influence others turned to the consumer. There are two good examples that somehow contribute to the idea that this consumer-led model is not bad for business and it works for both new and established artists.

2.1.2 Emerging artists

When in 2003, English act Arctic Monkeys started burning CD demos of their tracks and distributing them to the fans at their shows, they had no idea what they were unleashing. A small legion of fans, that had access to those demos, shared the music tracks on the Internet and even created and managed the band's Myspace page. The band's success in social networks, especially MySpace, attracted traditional media and record labels' attention (Barton, L., 2005) and they finally signed a record deal with alternative music label Domino in 2005. In early

2006, they released their first full length, “Whatever people say I am, that’s what I am not”, which, despite the fact that most of the songs were already available on the internet, became the fastest selling debut album in UK chart history, selling 363,735 copies in the first week only. Later that year they won the Mercury Prize for album of the year and have since then released two follow up records that consolidate them as one of the most successful alternative rock bands of our time (Wikipedia, 2010).

2.1.3 Established artists

Radiohead are one of the most important music acts of our time and each release is almost certain that will be critically acclaimed and a commercial success (Anderson, C., 2009). They have always been considered a band ahead of their time, as for music is concerned, but they also surprised the world with a marketing stunt when they released their latest album, *In Raibows*. The album was a self-release, their contract with the major EMI had ended, and they decided to release it as digital download two months prior to the physical format release (Anderson, C., 2009). The innovation was the price of the digital download, “make your price”. The consumer decided how much the album was worth (it could be zero) and the results were excellent. In Rainbows became Radiohead’s most commercially successful album to date, selling over 3 million copies until October 2008. When the album was released in physical format it went directly to number 1 in the UK and US charts and it also reached first place on iTunes in the first week. The “make your price” statement resulted in a huge buzz in social media (Anderson, C., 2009), which might have contributed to the tremendous sales success.

Consumers, even if unconsciously, can be the ones responsible for the marketing campaigns; it is the industry’s (labels and artists) responsibility to provide the best set of tools for them to perform “their task”. Consumers/users must have at their disposal functionalities that allow them to share music content and interact with the online communities, playing the role of radio DJs, magazine critics or TV hosts of the new Era.

2.1.4 Emerging Business Models

There is still a lot of discussion among the music community of how can record companies compensate the loss of income from record sales. The solution may consist of a mixture of the following possibilities:

a) “music like water”, a proposal from media futurist Gerd Leonhard that defends that music should be available for free on the web at the expense of a monthly fee paid through, for example, your internet service provider (ISP) (Leonhard, G., 2008);

b) added value, extra-content or service added to the album copy. Some of the added features might be a ticket to a nearby show, exclusive band merchandising, special cover artwork, video footage, raw files for editing purpose, etc. (Wendel, E., 2008);

c) 360 business model, a diversification of labels line of business, labels handle all of that is related to music. Record labels take control of the artists management, merchandising, concert tours, sponsor deals, etc (Anderson, C., 2009).

2.1.5 Music Applications

The author conducted a systematic analysis of music applications. Due to the amount data collected only some of the applications are addressed in this topic. For more information see Appendix 1.

Last.fm[13]

Last.fm uses "Audioscrobbler" a music recommendation system that creates a detailed music preference profile. This is determined by saving the user’s listening habits details from the user's PC (e.g. iTunes plugin), portable music players (e.g. iPhone) or online music players (e.g. YTFM). Last.fm then uses this retrieved information to recommend similar artists and music events.

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[13] See www.last.fm

Blip.fm[14]

Blip.fm is a social network, similar to Twitter, where one can post music with short messages.

iTunes[15]

ITunes is a digital media player, which organises and plays digital music and videos. This application can also connect to the iTunes store to purchase and download music. It can also be used to manage portable devices such as iPhone, iPod and iPad

Spotify[16]

Spotify is an application that allows unlimited streaming of selected music from a vast music library. There is an ad-supported version free to download and there is also the premium user that has to pay a monthly subscription, which gives the user ad-free access and other benefits. Spotify has approximately seven million users as of May 19th, 2010.

2.2 Web of people and content

More than five years have passed since Tim O'Reilly and John Battelle first talked about "the Web as platform" in the first Web 2.0 Conference in 2004. Most of their predications were correct, the web became a living collaborative system supported by the end user himself with applications that get more efficient the more people use them and the network did become a platform. However in these five years other changes have occurred that are altering the Internet landscape.

2.2.1 Web meets the World

"*The Web is no longer a collection of static pages of HTML that describe something in the world. Increasingly, the web is the world – everything and*

[14] See blip.fm
[15] See www.apple.com/pt/itunes
[16] See spotify.com

*everyone in the world casts an "information shadow"(*O'Reilly, T. & Battelle, J., 2009).

Nowadays, objects, events, ideas and even individuals exist in both physical and digital world. Increasingly things we own, consume and create are represented in the form of data on the Internet, an "information shadow" of those things. Although this may seem as a new concept, it has been used for several years. In fact, one of the first and best examples of this concept is related to the music industry, the Compact Disc Database (CDDB) [17] . The CDDB database, provided by Gracenote[18], stores information of the compact disc (CD) we own creating a virtual presence of our object. This is also a good example of an application whose content is generated by the user (UGC) and that gets better the more people use it. If a CD is not found on the database (DB) the application asks the user to submit the information to the DB or if he feels that the information on an album is incorrect he can edit the information and correct it. Sometimes there is duplicate information of the same CD and the system asks the user to choose the one he thinks is more accurate. This makes the application more efficient through time.

The "information shadow" is a key concept on this research. In music related applications the different type of users, content, objects, locations and media have scattered information all over the Web. The data is often stored in different locations and different web services are used to manipulate it, so finding ways to manage this relational data is one of the greatest challenges in this research.

Web squared is a new term again introduced by O'Reilly and Battelle on 2009's Web 2.0 Summit. The term is used to describe the way the web is no longer limited to the network as we perceive it until now. The Web is now connected to the world. The web of things, everyday objects connected to the Web, is in its still in an early stage of development.

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[17] http://en.wikipedia.org/wiki/CDDB
[18] See http://www.gracenote.com/

2.2.2 Location

Location plays now an important part on the Web ecosystem. Powered mostly by the widespread of mobile phones with geo-location (GPS or cell-tower triangulation) the location feature gradually gains importance in network applications. The use of location functionalities might have started via mobile, due to its portability and dimensions characteristics, but it is now quite common on web-based applications as well. In this case the location is determined by the IP address or by the user himself that sets his current location. A good example is the recently added location feature on Twitter. The user sets its current location, up to date only a few regions are available, to narrow search results for trending topics to the region he is in. Technically this is not more than a cross-reference search using the user's location as a keyword, however it shows that even in social networks what happens in the user's physical context might be relevant.

Another example of a web-based application's use of a location feature is the event search functionality on Last.fm. The user can search for music concerts on his region and narrow his search according to his musical preferences.

2.2.3 Social Media

Social media landscape embraces a wide range of websites and applications (see Figure 1) that have social interaction as common feature and has been evolving since the early days of Web 2.0.

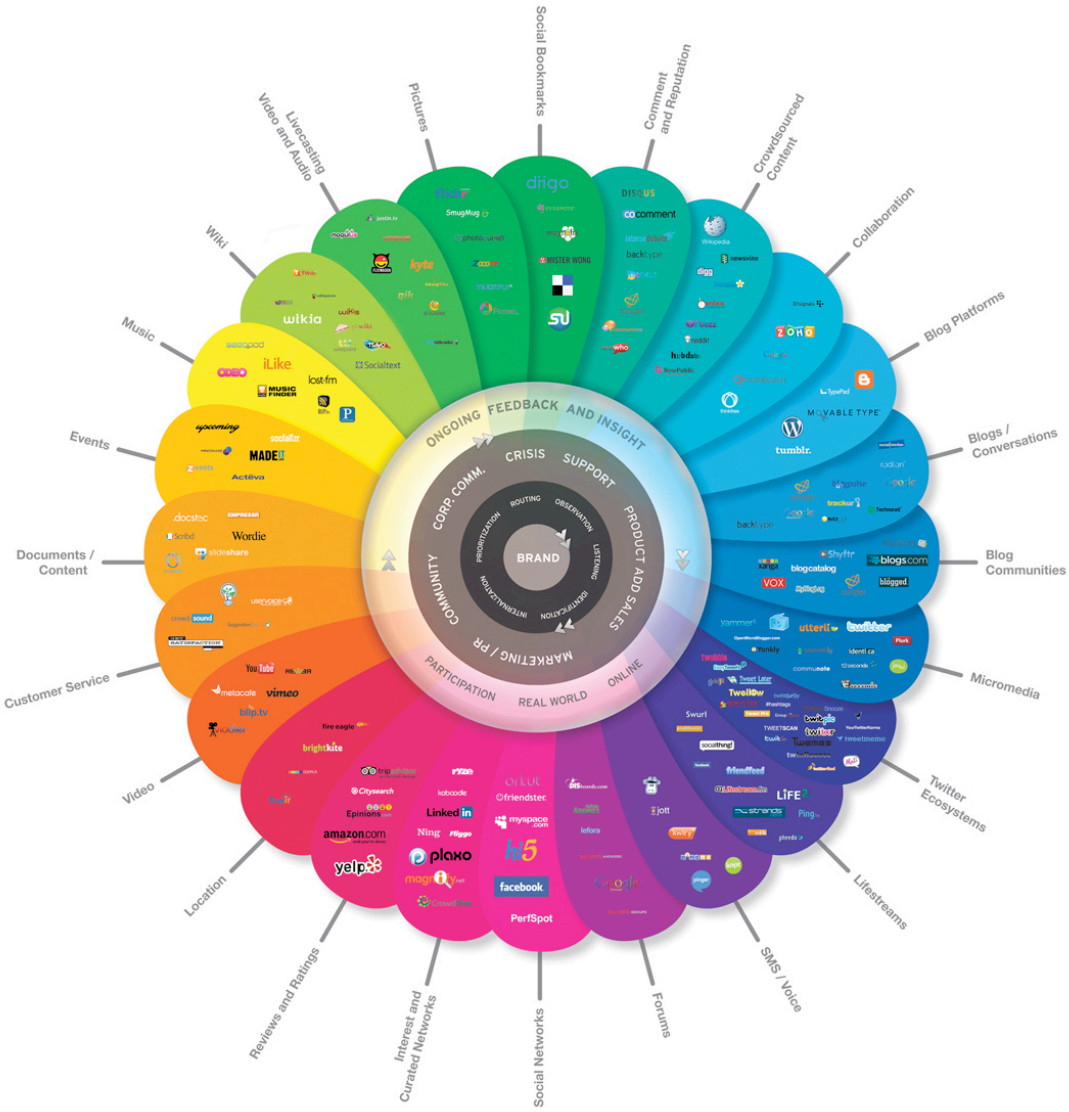

Figure 1 - The conversation prism by Brian Solis. A snapshot of the social media landscape.

Such variety of Social Media applications demanded a proper definition of the term and classification of the different social media types. In the paper "Users of the world, unite! The challenges and opportunities of Social Media", Kaplan and Haenlein define Social Media as "*a group of Internet-based applications that build on the ideological and technological foundations of the Web 2.0, and that allow the*

creation and exchange of user-generated content". The same authors propose a classification of Social Media by social presence/media richness and self-presentation/self-disclosure (see table 1). According to this classification, Kaplan and Haenlein established 6 categories of Social Media types: i) collaborative projects; ii) blogs; iii) social networking sites; iv) content communities; v) virtual social worlds; vi) virtual game worlds (Kaplan, A. & Haenlein, M., 2009).

The aforementioned classification will be important on this research for it will allow determining which types of Social Media are most suitable for promoting music events.

		Social Presence / Media Richness		
		Low	Medium	High
Self-presentation / Self-disclosure	High	Blogs	Social networking sites (e.g. Facebook)	Virtual Social Worlds (e.g. Second Life)
	Low	Collaborative Projects (e.g., Wikipedia)	Content Communities (e.g., YouTube)	Virtual game worlds (e.g., World of Warcraft)

Table 1 - classification of Social Media (Kaplan, A. & Haenlein, M., 2009)

2.2.3.1 Real-time

Information has gone faster but it is not due to any improvement on Internet connection speed it is by advent of Twitter and other microblogging[19] applications. "See what's happening right now", the new Twitter slogan explains what this service has become, a new real time source of information and news (with a record of 3085 tweets per second in the 30 seconds after the National Basketball Association (NBA) Finals on June 17, 2010). The advent of microblogging led to a shift on users' expectations on information speed, they want to know what is

[19] See http://en.wikipedia.org/wiki/Microblogging

happening in the second it occurs. This shift from traditional blogging to microblogging forced also a change on infrastructures and search technology (O'Reilly, T. & Battelle, J., 2009). While blog posts imposed that search engine crawlers updated the engine's database hourly, real time blogging introduced the necessity of real time search. A second later a user retrieves his search results, the information received is out-dated because an average of 1100 tweets per second are posted.

2.2.4 State of the art

Due to the large number of existing social media applications, the author has decided to include only the most representative. The presented applications were chosen based on the top twenty social media applications according to Alexa's[20] analytics charts and are organized according to their dominant area of intervention.

2.2.4.1 Social Media

Twitter

Twitter is a microblogging platform that enables sending and receiving short messages (140 characters), commonly referred to as *tweets,* publicly or within a network with limited access. Twitter provides an open Application Programming Interface (API) that allows third-party integration of its service and the development of new applications for the Twitter ecosystem. Twitter has 100 million active users.

Facebook

Facebook is a social network, which allows its users to keep up with friends, share links and upload photos and videos. Facebook is the number one social network in traffic rank, according to Alexa, and it has 400 million active users.

[20] See www.alexa.com

Flickr[21]

Flickr is an online community that provides image and video hosting services. It is one of the websites of choice to share and embed photographs among web users. Flickr has 32 million active users.

MySpace

MySpace is a social network website and, for a few years, was the number one social network until it was overcome by Facebook in 2008. One of its most interesting characteristics is that it distincts profiles and layouts for people, musicians and filmmakers. MySpace was launched in August 2003 and now has 130 million active users (22nd on Alexas rank in June 2010).

LinkedIn[22]

LinkedIn is a social network website specially oriented for professional networking. It is a contact network that relies on second-degree and third-degree connections to create a wider professional network. LinkedIn can be used to find jobs and business opportunities. LinkedIn has more than 70 million registered users and it holds the 28th place on Alexas traffic rank in June 2010.

Hi5[23]

Hi5 is a social network site that recently has initiated a social gaming approach. It was founded before Facebook but it was overtaken by it in the last few years. Hi5 has 80 million registered users and it holds the 85th place on Alexas traffic rank in June 2010.

Orkut[24]

Orkut is a social media site similar to Facebook and MySpace and very popular among Brazilian and Indian users. Owned by Google Inc., Orkut has over 100 million active users.

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[21] See www.flickr.com
[22] See www.linkedin.com
[23] See hi5.com
[24] See www.orkut.com

For a more comprehensive list of Social Media applications see Wikipedia's List of Social Media, based on Alexa's analytics data collections.

2.2.4.2 User-Generated Content

The term User Generated Content (UGC), describes various forms of media content that are created by end-users and that are publicly available. The Organization for Economic Cooperation and Development (OECD) states that in order to be considered a UGC, content must fulfil three basic requirements (Vickery, G. & Wunsch-Vincent, S., 2007):

a) it must be published on a public accessible platform or on a social network and available to a selected group of users;

b) it must reveal a certain amount of creativity, the user cannot just share content created by other individual without any add on of creativity;

c) content must not be developed by professionals for commercial purposes.

UGC plays an important role on social media, because it is UGC or user submitted content that supplies content for social networks. Whether it is a video upload to YouTube, a photo on Flickr, an album review on Amazon and an opinion post on a blog or Facebook, they all contribute to the richness of the Social Networks and stimulate users' interaction.

2.2.4.3 Online Video Platforms

YouTube

YouTube is a video storage and sharing network subsidiary of Google Inc.. Its users can upload, share and watch videos. Most of its content is UGC but many companies now share their videos for promotion purposes (not considered UGC content). YouTube is 3rd on Alexas rank in June 2010.

Vimeo[25]

Vimeo is a video-sharing social network and presents itself as an alternative to YouTube. It also enables upload, share and watch videos with a special attention to social interaction. Vimeo is ranked 212th on the Alexas traffic charts and it had 3 million users in March 2010.

LiveStream[26]

LiveStream, the website formerly known as Mogulus, is a live streaming video platform that enables users to broadcast and watch video content. LiveStream started by providing channels for continuous use but it also provides customized pages for unique event broadcast (e.g. TEDx or Foo Fighters concert).

Ustream[27]

Ustream is a live streaming video platform that enables users to broadcast and watch video content. It offers several social media features including live chat. Ustream has 2 million registered users.

Justin.tv[28]

Justin.tv is a live streaming video platform that enables users to broadcast and watch video content.

Hulu[29]

Hulu is a streaming video website that broadcasts TV shows and movies from some of the most important Television Networks in the United States (US). Due to legal restrictions, Hulu is only available in the US. Besides its web-based application, users can also watch Hulu on their TVs through, as an example, their WII console. A desktop version of Hulu is also available on Windows, Linux and Mac OS.

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[25] See vimeo.com
[26] See www.livestream.com
[27] See www.ustream.tv
[28] See www.justin.tv
[29] See www.hulu.com

Boxee[30]

Boxee is a cross-platform freeware home theatre PC software with social network functionalities. Boxee allows its users to view, rate and recommend content to their friends through many social networks.

2.2.4.4 Social Functionalities

In order to conduct a thorough analysis of the most common social functionalities available on social network video platforms, the author first identified a set of features commonly used in social network in general. This selection was based mostly on the work of Leitner and Grechenig, that analysed 100 social network sites and determined the most common social functionalities, than the aforementioned video platforms were submitted to a systematic analysis (see Table 2)

	Youtube	Vimeo	LiveStream	Ustream	Justin.TV
Like	x	x	x		
Rating					
Tag	x	x		x	x
Comment	x	x			
Review					
Share	x	x	x	x	x
Live Chat			x	x	x
Recommend					
Favourite	x				
Friend/Follow	x	x			
Groups		x			
Feeds	x	x	x	x	x
Lists	x	x	x		
Private messaging	x	x			
User profile	x	x	x	x	x
Report abuse	x	x			
Embed in external	x	x	x	x	x

Table 2 - social features on live streaming players

[30] See www.boxee.tv

2.3 Mashups – a web of services

Nowadays, Mashups are becoming very common on the Web 2.0 ecosystem. There are two factors behind this increase on the use of Mahups Technology. First of all, mashups are simple to develop. Using web-based mahups tools such as Dapper, DERI Pipes or Microsoft Popfly end-users with none or little programming skills can quickly develop mashups combining two or more different sources. Secondly, and probably more important for this research, with the advent of mashup technology, redundant data can stop being an issue. Users no longer have to submit and update their profile on different locations, they can connect to website using their Facebook or Google existing accounts, for example. It also enables developers to use certain functionalities and services from third-party sources. They can concentrate their efforts on developing and improving their application's differentiae functionalities that will shape the project's distinguished concept. There is another great advantage when it comes to Social Network applications, instead of kicking off with a community of just a few users, they can start with millions of users, just by seamlessly connecting to an existing social network (e.g. Facebook has 400 million active users, according to the company's statistics report).

2.3.1 Definition

In a research that addresses areas such as web applications, video and music, the exact definition of the term Mashups is of utmost importance, for the term is used in all of these areas and an unclarified definition might lead the reader to misinterpretations. In fact, the origin of the term has its roots in music, when disc jockeys (DJs) started to mash two songs together creating a new artistic output. Later, video professionals also adopted the term, by editing two or more videos together with the outcome resulting in an entirely different message. The web has always adopted terms and paradigms from other media (e.g. the timeline concept used in film making) and soon adopted the mashup concept. Mashups is a recent

and still evolving technology so it is quite difficult to find a consensual definition of the term. From all of the definitions encountered through the state of the art research, one presents to the author as more adequate to this research. Koschmider et al., define mashups as a "*web-based application that is created combining and processing online third-party resources that contribute with data, presentation and functionality*" (Koshmider, A. et al., 2009), despite the adequacy of this definition, complementary information gathered through this research indicates that adjustments can be made. Koschmider et al. restrict the definition to web-based applications but recently deployed applications such as Foursquare[31] suggest that this technology is also being used in mobile devices. In fact, mobile companies such as British Telecom (BT) are investing money and resources on developing application-programming interfaces (APIs) that enable access to their infrastructures (messaging, call control and mobile functionalities)[32]. Efforts are even being made to provide end-users the ability to develop lightweight mobile applications like Microsoft's Merlion, a system that enables end-users to develop customized mobile applications creating mashups from existing desktop applications.

For this reason, and for the purpose of this research, the author proposes that mashup should be defined simply as an application that is developed combining and processing online third-party resources that contribute with data, presentation and functionality.

2.3.2 API - application-programming interface

An application-programming interface (API) is an interface that allows the interaction between different software programs. Like user-interfaces enable the interaction human-machine, they enable the interaction software-software.

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[31] see http://foursquare.com/
[32] see http://www.programmableweb.com/featured/telephony-mobile-apis-and-mashups

A Web API, also known as web service, enables communication of multiple services. As an example, it can be used to share photos from Flickr or videos from YouTube into Facebook or Twitter.

2.3.3 State of the art

The number of available APIs is rising everyday. According to the Programmable Web (PW) directory, an important reference and resource for mashup developers and researchers, there are 2034 known APIs enabling 4894 mashup applications, as for June 26, 2010.

GoogleMaps is, by far, the most used web service, followed by Flickr and YouTube. By analysing Chart 1, with the top 10 most used Web APIs, we can identify a preference for geo-location, user-generated content, ecommerce and social network APIs.

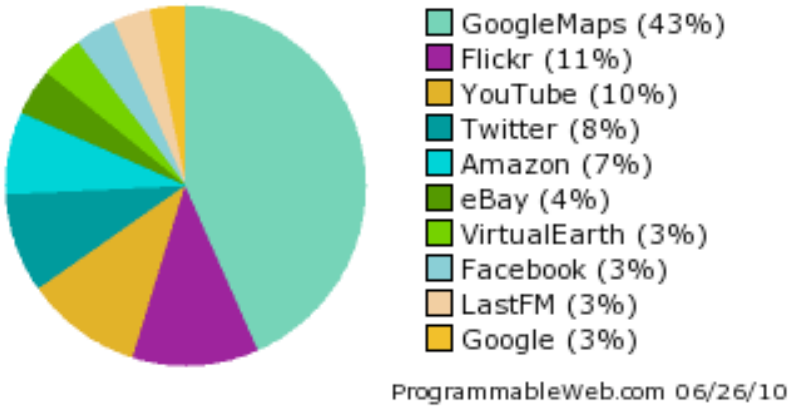

Chart 1 - most used APIs

Chart 2 – Top mashup types show the same preference when it comes to developed mashups. Again, location presents as an important feature and it seems to confirm what was mentioned on the first chapter (Web of content and people) that the physical location is gaining relevance on the web ecosystem. The tags related to media content are photo, video, music and news. The “social” tag, used in 6% of the registered mashups, indicates the importance of social networks.

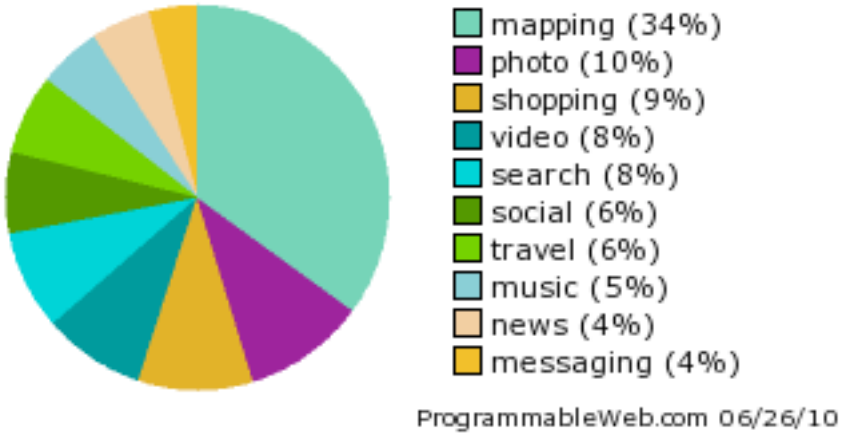

Chart 2 – Top mashup types

2.3.4 Music APIs and Mashups

In this topic, the twenty most used music APIs are presented. Although the "*protocols*" and "*data formats*" are not relevant to this analysis, the information was included in the table and it will be addressed on the technology topic, further on this document.

2.3.4.1 Music APIs

Last.fm's first place in the PW's Music APIs chart (see Table 3), might be related to the large amounts and different types data generated by the 40 million active users. The API allows retrieving all sorts of information concerning the artist, album, song, event (concert), venue and the listener's profile itself. With such a data base, generated mostly by user submitted content (artist biography, album revue, etc) and constantly updated, developers can obtain most of the information commonly used in a music application and, simultaneously, the user's listening habits without the need to access different sources (web services).

The author points out that two of the twenty most used APIs are related to music concerts which, in addition to the events and venues feature of the Last.fm's API, might contribute to the notion, mentioned previously in this document, that there is a new correlation between online and local networks.

It is also interesting that two of the three most used API's are song lyrics search engines. This might indicate that it is a feature requested by users of music applications and it should be taken in consideration in the course of this research.

API	Description	Protocols	Data Formats	Mashups
Last.fm	Online radio service	REST	XML, Text, XSPF, RSS	158
Lyricsfly	Song lyrics search engine	REST	XML	26
LyricWiki	Song lyrics search engine	SOAP	XML	23
MusicBrainz	Music metadata community service	REST		19
SeeqPod	SeeqPod Music Discovery	REST	XML	17
Rhapsody	Online music services	REST	XML	16
Echo Nest	Music services for professionals	REST	XML	9
SoundCloud	SoundCloud is a music and audio platform for the web	OAuth	XML, JSON, JSONP	8
Yahoo Audio Search	Music search services	REST	XML, JSON, Serialized PHP	6
Blip.fm	Social music service	REST	XML, JSON, Serialized PHP	5
Bandsintown	Music concerts and recommendations service	REST	XML, JSON	4
Billboard	Music chart service	REST	XML, JSON	4
openDada	Social music service	REST	XML	4
SNOCAP	Digital music marketplace	REST	JSON	4
Yahoo Music	Music and musician info and videos	REST	XML, JSON. RSS	4
Yes BroadCast DB	Radio station search, now-playing, logs and charts	REST	JSON	4

Table 3 - Music APIs

2.3.4.2 Music Mashups

In a quick overview to a list of music mashups applications, it stands out that Last.fm is the most used API, confirming what was mentioned in the music API analysis, but also that is often used in conjunction with APIs that provide access to complementary media content (e.g. YouTube and Flickr).

Mashup	URL	API
Albumart.org	http://albumart.org/	Amazon, AmazonSimpleDB, Lyricsfly, SeeqPod
Antenna	http://bcdef.org/antenna/	YahooMaps, RadioTime, OpenStreetMap, GoogleMapsFlash, ESRIArcGISJavaScript
MusiPortl	http://www.musicportl.com/	Technorati, Ontok, YouTube, Amazon, LastFM, Flickr, MusicBrainz
Akama Music	http://akama.co.uk/	Wikipedia, LastFM, Flickr, Amazon
YTFM	http://www.blaisekal.com/play/YTFM	hostip.info Last.fm YouTube
Music Artist Cloud		YouTube, LastFM, Amazon, Google
Foxy Tunes Planet	http://www.foxytunes.com/planet	YouTube, YahooImages, YahooAudio, MusicBrainz, LastFM, GoogleAjaxSearch, Flickr, Amazon
1000 songs	http://1000songs.ebotunes.com/	LyricWiki, LastFM, Guardian
The Hype Mashine	http://hypem.com/	
Air Veejay	http://www.beamjive.com/weblog/?p=55	MTV

Table 4 Music mashups

2.3.5 Social APIs and Mashups

2.3.5.1 Social APIs

When it comes to social APIs usage, Twitter and Facebook take the lead but it is interesting to see that Twitter almost triples Facebook in the number of Mashup

applications that currently use its APIs, when the number of Facebook users (400 Millions) is four times the number of Twitter users (100 Million). The distinct characteristics of these social networks might be the reason for this interesting phenomenon. While Facebook is a social network that presents a natural evolution from older networks such as Hi5 or MySpace, Twitter introduced a new paradigm, live status updates. Due to its short message service (SMS) look alike, Twitter became the media of choice for spreading information on the Web (Tatsubori, M. 2009) and across multiple devices with a record of 3085 tweets per second in the 30 seconds after the National Basketball Association (NBA) Finals on June 17, 2010. Combining this fast status update characteristic of Twitter with the fact that most social networks, such as LinkedIn, MySpace or even Facebook, enable Twitter integration, developers might be lead to use Twitter's API for it allows to several networks with one API call.

API	Description	Protocols	Data Formats	Mashups
Twitter	Microblogging service	REST	XML, JSON, RSS, Atom	411
Facebook	Social networking service	REST	XML	160
LinkedIn	Business social networking platform	REST, Atom	XML	22
MySpace	Social networking service	REST, OAuth, JavaScript	XML, JSON, Atom	20
Tumblr	Web scrapbook post and view service	REST	XML, JSON	12
HotOrNot	Dating rating site	REST	XML	11
FourSquare	Social networking and city exploration	REST	XML, JSON	8
Pownce	Social networking and micro-blogging service	REST	XML	8
Brightkite	Location sharing service	REST	XML	7
Google Friend Connect	Social network service	REST, JavaScript	XML	7
Imeem	Social networking and media service	REST, JavaScript	XML, JSON, AMF	6
RapLeaf	Portable reputation system	REST	XML	6
Bebo	Social network	REST	XML	5

Table 5 - Social APIs

2.3.5.2 Social Mashups

In the sample of social mashup applications shown on Table 6, we can see that several applications use simultaneously social (e.g. Twitter, Facebook or LinkedIn), search (e.g. Yahoo or Google) and location APIs.

Mashup	URL	API
#LinS	http://roelandp.nl/devdev/linkedin/	LinkedIn, GoogleChart
44tips	http://www.44tips.com/us/	YouTube, Twitter, Thumbalizr, LinkedIn, LastFM, Hyves, Flickr, Facebook, del.icio.us
Flickrbook	http://www.facebook.com/apps/application.php?id=54346234742	Flickr, Facebook
GeoMeme	http://www.geome.me	YahooTerms, Twitter, GoogleStaticMaps, GoogleMaps, GoogleAppEngine

Table 6 - Social Mashups

2.3.6 Other APIs

Table 5 presents the most used Web APIs that are outside the scope of music and social networks.

API	Description	Protocols	Data Formats	Mashups
Google Maps	Mapping services	JavaScript	XML, VML, JSON, KML	1986
Flickr	Photo sharing service	REST, SOAP, XML-RPC	XML, JSON, PHP	526
YouTube	Video sharing and search	GData, Atom Publishing Protocol	XML, JSON, RSS, Atom	475
Amazon eCommerce	Online retailer	REST, SOAP	XML	351
eBay	Online auction marketplace	REST, SOAP	XML	190
Microsoft Virtual Earth	Mapping services	JavaScript	KML, GeoRSS	175
Google Search	Search services	SOAP	XML	154
Del.icio.us	Social bookmarking	REST	XML	150
Yahoo Search	Search services	REST	XML, JSON, PHP	137
Yahoo Maps	Mapping services	REST, JavaScript, Flash	XML	127

Table 7 - General APIs

2.3.7 Technology

As mentioned before, a mashup prototype will be developed, on the course of this research, for testing purposes. In order to develop a proper application a thorough research on the state of art technology is mandatory. This state of the art research consists not only by readings of technical documentation but also of a systematic analysis of the most used APIs, allowing the identification of the architecture, protocols and data formats of choice for experienced developers.

After the referred analysis, the author identified the widely used technologies that are explained in detail in the further topic.

2.3.7.1 Architecture and Protocols

A mashup application architecture is split into three layers: i) presentation or interaction layer, the user interface of the client program, it uses HyperText Markup Language (HTML), eXtensible HyperText Markup Language (XHTML), Cascading Style Sheets (CSS), JavaScript and Ajax; ii) communication layer is where connection with the web services occurs, typically uses Simple Object Access Protocol (SOAP), Representational State Transfer (REST), eXtensible Markup Language remote procedure call (XML-RPC) and JavaScript Object Notation remote procedure call (JSON-RPC); iii) Data handling, the most common data formats are eXtensible Markup Language (XML), JavaScript Object Notation (JSON) and Keyhole Markup Language (KML).

SOAP

Simple Object Access Protocol (SOAP) is a protocol used in Web APIs (Web Services) for intercommunication of structured data. SOAP uses other protocols as transport methods and although both SMTP and HTTP present as valid application layer protocols, HTTP is the most suitable for state of the art firewalls. This protocol uses eXtensible Markup Language (XML) as its data format. Some disadvantages have been pointed, especially when it comes to the use of HTTP's methods and that is probably why, as shown in table 1, 3 and 5, the Representational State Transfer (REST) architecture is widely used.

REST and RESTful Web API

Representational State Transfer (REST) is architecture that uses World Wide Web common protocols and technology (e.g. HTTP) to allow communication machine-to-machine, typically client to server. It is simpler to use than SOAP because it does not require a client program and server program for data exchange. The REST architecture is the principle behind the RESTful Web API implementation that uses HTTP methods such as POST or GET to exchange data in the formats of XML and JavaScript Object Notation (JSON), among others.

2.3.7.2 Data formats

XML

eXtensible Markup Language (XML), is a standard human-readable way of describing structured data, recommended by the World Wide Web Consortium (W3C) .

JSON

JavaScript Object Notation (JSON), like XML, is a standard human-readable way of describing structured data. It has its roots in the JavaScript programming language but it is accessible from every programming language.

3 Empirical Research

3.1 Urock concept overview

Urock is permanent music festival, a user-generated content cross platform application specially oriented for publishing and broadcasting musical content, where bands and artists from all over the world and with different types of notoriety can play to their fans and reach new audiences. Its main objective is to help new or established artists to promote their work, creating a bidirectional communication channel between artist and audience.

There are to key types of users in this platform, fans and artists. The already mentioned problem with information redundancy obviously affects both users, but, in the author's opinion, the problem is bigger with the artist's profile. With the advent of web services it is now easier to connect a common user's profile with his existing profile on another social network. For example, two of the most notable social networks, Facebook and Twitter, offer methods, through their API, that allow users to sign on to a website with their existing credentials, therefore conceding access to their information and content. Artist users also use these networks so it could be argued that the same stands for this user profile. However, the user "artist" has typically more content associated with him. Furthermore, that media content can be stored in different locations and, depending on the artist's notoriety, most of that content can be fan generated, which might mean that the artist has limited control over it. For example, 7 out of 10 of Radiohead's most viewed videos on YouTube, were uploaded by non-official users (i.e. artist or label official page)(Appendix 8). It is expected that a similar ratio might occur with photos or user-generated text.

A typical artist's profile could consist of the following fields (based on MySpace Music profile[33]):

- Biography
- Discography
- Profile picture
- Photos
- Music
- Videos
- News
- Concert information

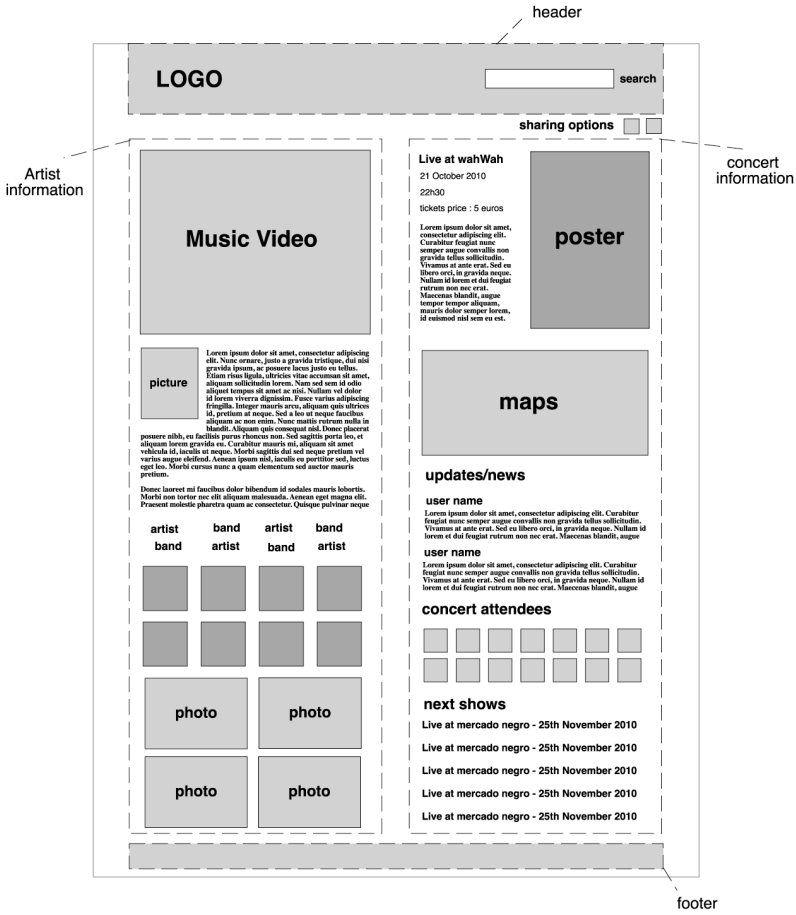

Figure 2 - Artist profile layout

Considering the above list as the minimum required information to feature on Urock's artist profile page (Figure 2), the author objective is to understand how can it be populated with the relevant content, retrieved from various sources, thus preventing the need for the user to submit redundant information.

[33] See http://www.myspace.com/music

3.2 Mashup model

Considering the upper mentioned profile structure, an analyses of the API's (presented on tables 4, 6 and 8) reference guides were conducted that allowed the author to elaborate the following mashup model.

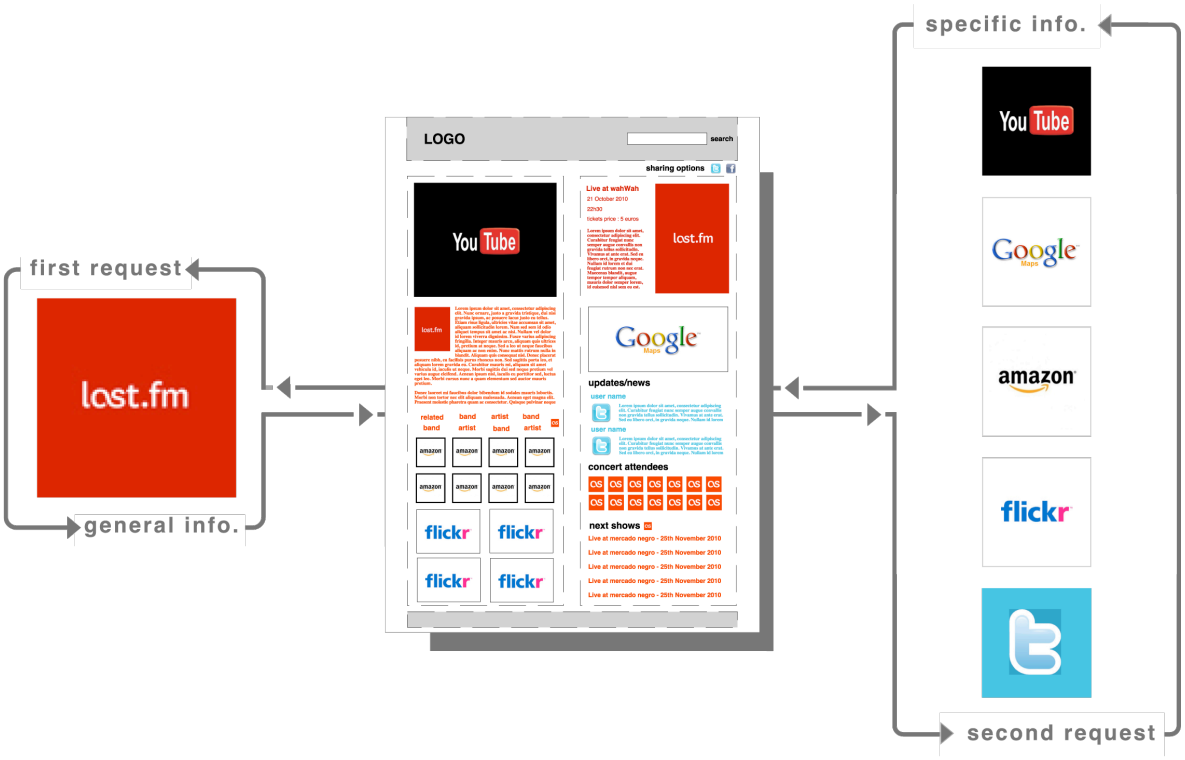

Figure 3 - Mashup Model

A total of 6 different API's will feed the artist's profile page on Urock (see Figure 3):

- Lastfm - biography, concert details and profile pictures;
- YouTube – music videos;
- Google Maps – Concert location;
- Twitter – tweets referring to the artist;
- Flickr – photos;
- Amazon eCommerce – Discography available at Amazon.

This model will support Urock's dynamic profile functionality that will allow the user artist to populate it with information (Figure 4). Upon registering, the system will present a preview of the profile based on a first request to the web services, along with a list of other possible results. The user will then be asked to confirm that the information is correct. If it is completely incorrect he can chose one of the other given results.

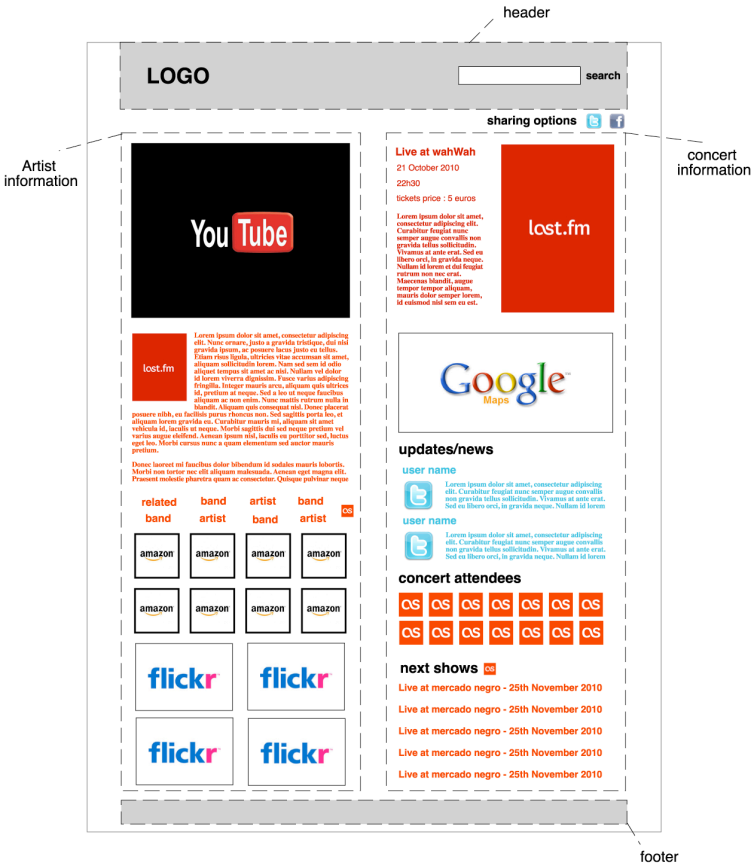

Figure 4 - Layout with API sources

Ideally, in order to properly test the model and the user-generated profile concept, which is the basis of this dissertation, the tests should be done with the Urock application. Unfortunately, due to its complexity and the limit of time, imposed by the master degree deadlines, it was acknowledged that it would be impossible to develop the application in time for the testing period. Technically, it would be possible to implement just the user artist page and test it but that probably would not result in the testing period. Without any other feature available, the users would not have any reason to visit the page and register. For this reason, it was decided to validate the same model with a different concept; one that attracts users and that would allow raising a substantial number of participants for the testing period. Basically, the requirements to test this model are a search system and a result page that presents a structured layout of the artist profile. The author then realized that this could work as separate product of Urock, if it was defined as

a music search engine. In this context, Musikki was born. The technical and functional requirements of Musikki are considerable less than those required to develop Urock. This means that the proof of concept's development period of Musikki could coincide with the deadlines of the master degree program. After consulting Juliana Teixeira, co-author of Urock, it was decided to develop Musikki as a separate product. Musikki's development team consists of the author itself, Pedro Almeida (data bases) and Juliana Teixeira (design), which all gave their consent to the author to use Musikki for testing purposes.

3.3 Musikki Case Study

3.3.1 Concept

Musikki[34] is a mashup based music search engine. With just one click it is possible to search different API's at the same time (Last.fm, YouTube, Flickr, Amazon, Twitter and Google Maps) and get all the information in one unique page result. The results of a search in Musikki are not several links to each one of its sources. The data is retrieved from different locations, structured and presented to the user in one unique page layout. With just one click the user assembles in one page the artist's biography, videos, photos, information about the next concerts and discography available on Amazon, among other things.

3.3.2 Target audience

Musikki aims to reach everyone that searches for music on the web. If Urock was the subject of study, the target audience (TA) would probably be defined within a group range that would fit teenagers and Generation Y age group[35]. However, due to its main characteristics (search, music, watch online videos, etc.) Musikki could reach at least the Generation X[36] age group (Jones, S. and Fox, S., 2009), which means that its TA should be between the ages of 13 and 44 years.

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[34] www.musikki.com
[35] http://en.wikipedia.org/wiki/Generation_Y
[36] http://en.wikipedia.org/wiki/Generation_X

3.3.3 Functional requirements

For this first beta version it was decided to just implement the minimum required functionalities to validate Musikki's proof of concept and, simultaneously, the mashup model in which this study is based on. For this reason, some functionalities idealized by the development team, that were part of the initial Musikki's concept, were left out of this prototype and will be implemented in future versions.

The website's landing page is composed solely by a search box and links for an about page, contact, Twitter and Facebook page. Therefore, with the exception of search, all functionalities are concentrated on the result page.

Search

Figure 5 - Musikki's home page search box

It is the key functionality on this service because all the following features depend on it. It triggers the algorithm that handles the request to all the APIs. When a user introduces an artist name it first requests the Last.fm API to return all the general information along with the name correction method. This is an important part of all of this process because, in this initial version, Musikki does not have a fully operational database registering system. This first request to Last.fm allows solving the more common problems with name spellings already detected by Last.fm service.

Video player

An embed YouTube player that displays the most relevant music video for the searched artist, which is returned by YouTube's Data API. The parameters of category (music) and embed option (only allowed) are passed in the request along with the artist's name with the objective refining the search results.

Artist Biography

The artist's biography and its profile picture are displayed in this content block. Both picture and text are retrieved from Last.fm's API. A size parameter (small) is passed in the request to guarantee that the picture retrieved has the desired size

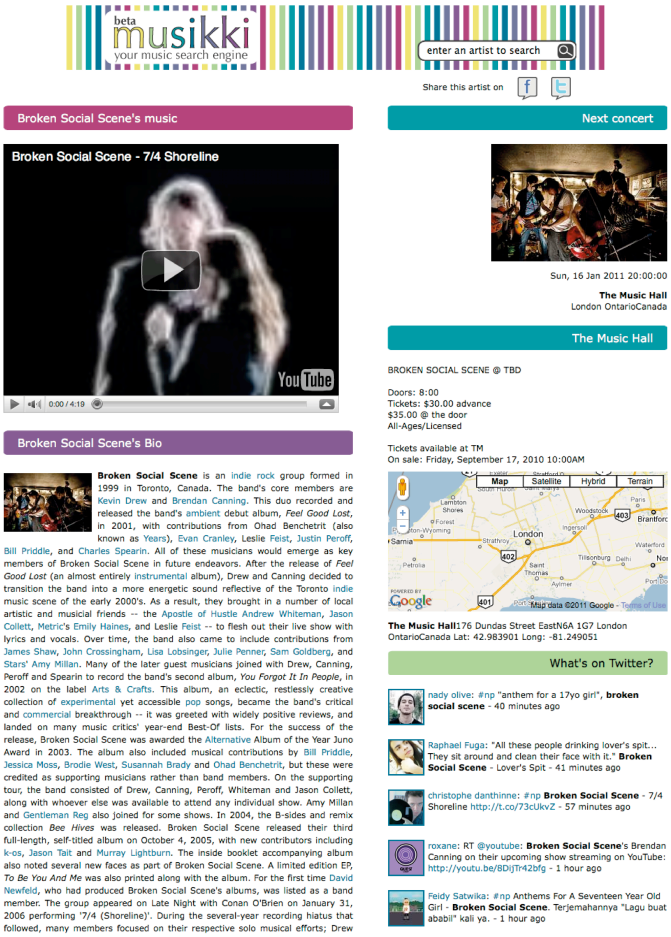

Figure 6 - Musikki's result page (top content)

Similar and Related Artists

This functionality allows the user to check for similar and related artist to the search result. It uses Last.fm API and it is based on the listening habits of its users. Therefore, the retrieved names are the ones that people that listen to the searched artist also listen to.

Discography

The artist's albums available at Amazon are presented in this section. It displays the albums' title and cover art, which the user can click to be redirect to product's detail page on Amazon. The algorithm uses the Amazon eCommerce API to retrieve the information and adds Amazon Associates' personalized identification tag to the returned URL. This procedure will allow receiving a percentage of a future sale of that product.

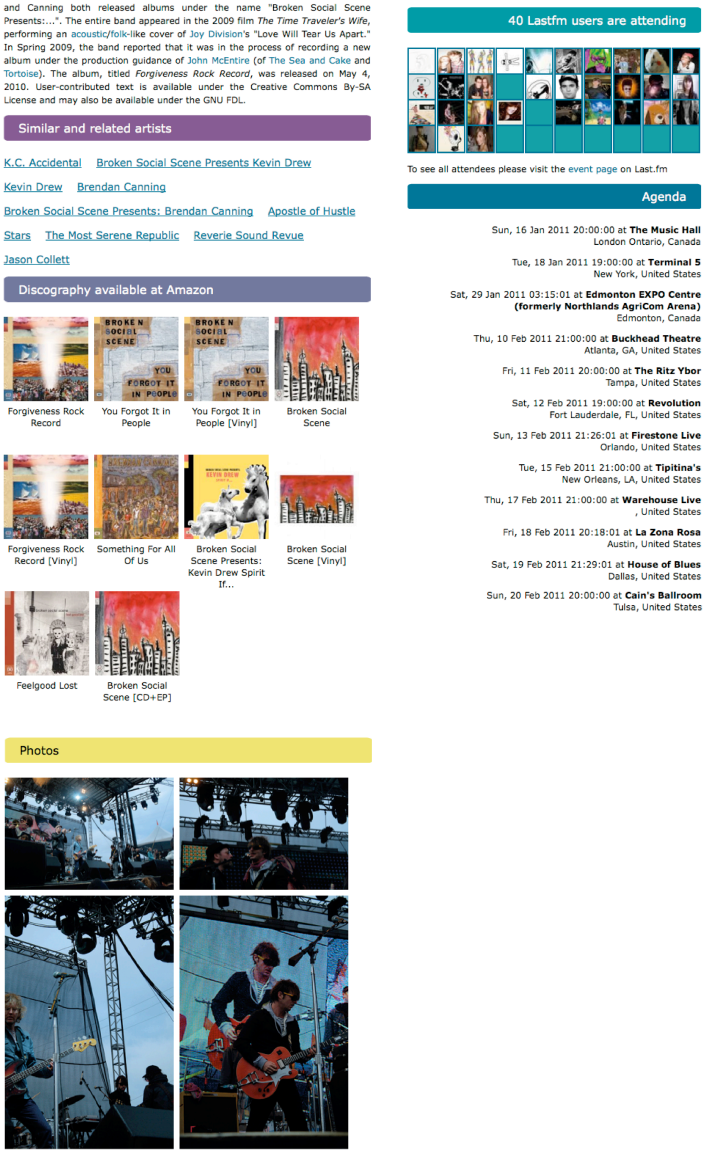

Figure 7 - Musikki's result page example (bottom content)

Photos

The Flickr API is used to present photos from the artists live performances. In order to filter the search results the terms “music” and “concert” are added to the query. The user can click on the picture to see it in full size.

Next Concert Information

In this area, detailed information about the artist’s next concert is presented. This information is supplied by the Last.fm API, which returns the concert’s poster (replaced by the artist’s profile picture when unavailable), time, date, location, venue, tickets price and description.

Next Concert Location

The request used in the previous functionality also returns the geographic coordinates of the concert’s venue. This data is used to call the Google Maps’ API and present map of the venues location.

Twitter Feed

A Twitter feed that displays the last 5 tweets on Twitter that contain mentions of the artist’s name. It shows the tweeted message text along with the user’s avatar retrieved through a request to Twitter’s APi.

Concert Attendees

It indicates how many Last.fm users have confirmed their presence at the event and displays the avatars of the first 40 users retrieved. It is possible to click on the avatars’ pictures to check the user’s profile page. A link to the event page on Last.fm is also given.

Concerts Agenda

A list of the artist’s next concerts (ordered by date). As in the concerts detail area, it uses the Last.fm API to get this information.

Share on Twitter

A share button that allows posting directly to the user's twitter wall. If the user is not connected, he is asked to login before proceeding with the request. By default it is added the text "Check out *the artist name* on Musikki" before the shared link.

Share on Facebook

The Facebook sharing functionality is similar to Twitter's and it also prompts a login page in case the user is not logged to Facebook yet.

3.3.4 Interface Design and Layout

The author developed the layout structure and wireframes, previously presented. Juliana Teixeira, from Musikki's development team, created the brand and interface design. Due to the quantity and diversity of content displayed, it was decided to keep a clear and simple design, in a minimal approach. Each of the coloured bars of Musikki's logo represents a content area on the layout. Consequently, each area's title bar has a different colour.

Figure 8 - design process

3.3.5 Prototype development

The development of Musikki's prototype presented to the author as an interesting challenge. He had never worked with mashup technology before, not even with most of the programming languages (PHP, XML, JSON and JavaScript) and architectures (REST or SOAP) required. The first two weeks of development were spent learning these technologies. The self-imposed learning program consisted of literature revue, exercises and tutorials.

To shorten the learning curve and, consequently, the development period the author used and adapted some PHP classes provided by websites like PHP Classes[37] and GitHub[38]. The study of these code examples was very helpful and contributed to the rapid acquisition of the necessary knowledge to develop the prototype.

The author started by developing a web page to test each of the APIs separately. After a careful analyse of the request parameters and response samples it was possible to establish relationships between the response of one API and the parameters of another. As an example, to display the map of an event venue the following sequence is made:

1. Request to Last.fm API using the *event.getInfo*[39] *method*:

```
$result = $lastfm->getRequest('event.getInfo',array('event'=>1073657));
```

2. XML Response (partial code):

```
<venue>
<id>8783057</id>
<name>Ryman Auditorium</name>
<location>
<city>Nashville</city>
<country>United States</country>
<street>116 Fifth Avenue North</street>
<postalcode>37219</postalcode>
<geo:point>

 <geo:lat>36.16148</geo:lat>
<geo:long>-86.777959</geo:long>
```

---

[37] see http://www.phpclasses.org/
[38] see https://github.com/
[39] see http://www.lastfm.com.br/api/show?service=292

```
</geo:point>
</location>
<url>http://www.last.fm/venue/8783057</url>
</venue>
```

3. The latitude (<geo:lat>) and longitude (<geo:long>) are passed on the request to the Google Maps API (partial code):

```
var latlng = new google.maps.LatLng(<?php echo
$result['event']['venue']['location']['geo:point']['geo:lat']; ?>, <?php
echo $result['event']['venue']['location']['geo:point']['geo:long']; ?>);
```

The process described above is the logic behind this mashup model. Last.fm is the most complete music API when it comes to music artist information. For this reason, it is used as primary request API to retrieve general information about the artist such as name correction, top played songs, biography or events, which than are used as parameters to call the remaining APIs (see Figure 9 - Musikki).

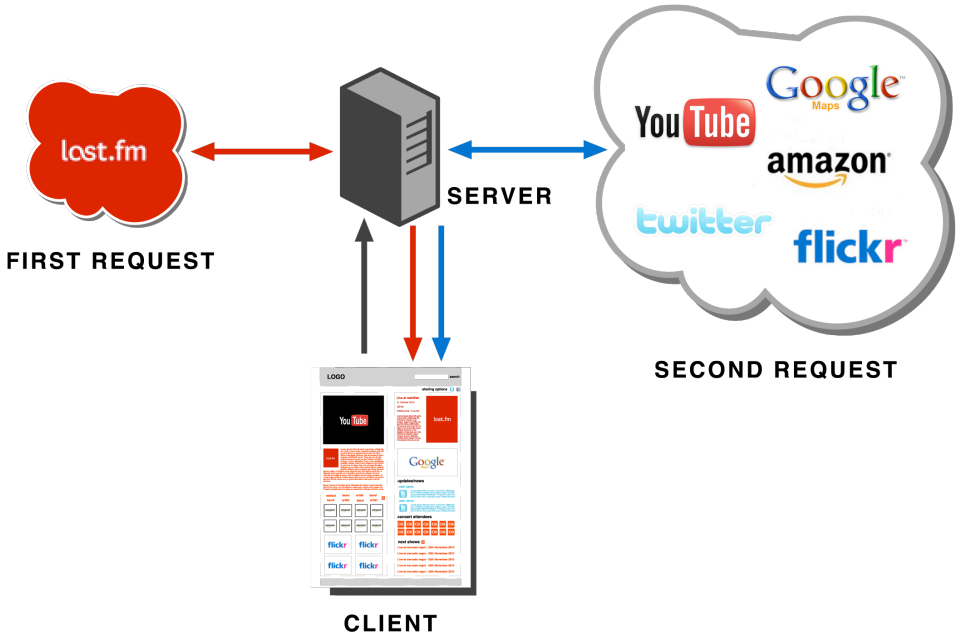

Figure 9 - Musikki architecture

The inexperience in this field of expertise (mashups), along with the limit of time to develop, explains some of the limitations of the prototype (e.g. PHP bugs) that will be properly addressed in future versions of the product.

3.4 Business model

The business model is based in three major income sources: i) indirect sales - this project is mostly based on mashups and the business model takes advantage of that approach by using the Amazon eCommerce and similar API's that allow to receive a percentage of every sale that had its origin on Musikki's website; ii) contextual advertising - based in several parameters such as users location, search history or search result (e.g. the searched artist has a new album and promotional material is added to the artist's profile result page); iii) Music industry consulting services – every search will be registered in Musikki's data based along with the user's location. This information will allow, for example, advising concert promoters which are the relevant artist to book.

3.5 Promotional Strategies

With the objective to gather as many participants as possible for the testing period, a small online marketing campaign was undertaken. This promotional campaign consisted of three main channels: social media presence, industry recognition (direct contact) and innovation awards.

3.5.1 Social media

The first step was to create Musikki's presence in social network. A Facebook fan page (Figure 10), Twitter (Figure 11) and LinkedIn were registered and customized, which followed the task of maintaining those networks active by updating it on a daily basis. These updates consisted of music recommendations such as the "Artist of the day…" daily post on both Facebook and Twitter, sharing of mentions

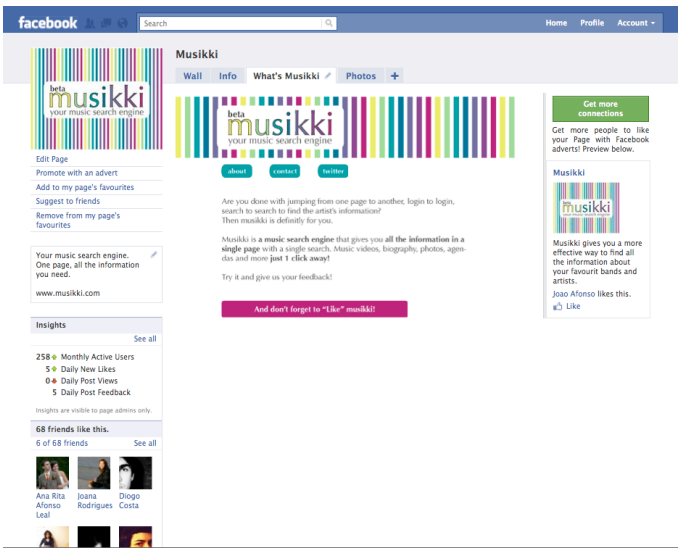

Figure 10 - Facebook page

concerning Musikki (blog posts, tweets and reviews) and direct interaction with the online community (direct messages sent to music industry professionals).

The adherence to Musikki's social media presence has been very interesting, 196 fans on Facebook and 257 followers on Twitter, by January 11, 2011. Further analyses and discussion of this is addressed in the topic *Data Presentation and Analysis*.

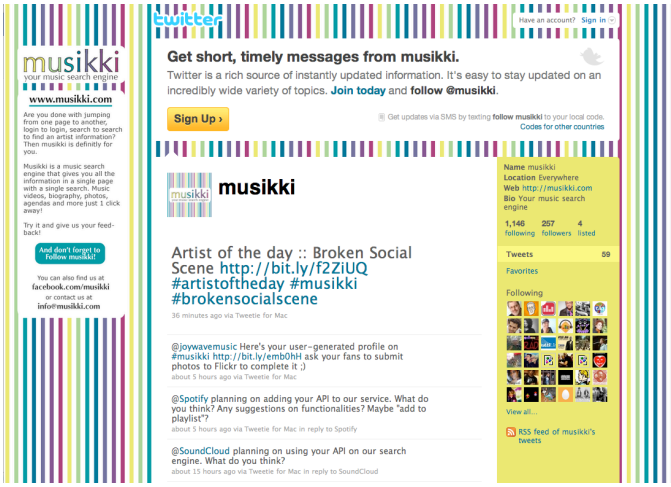

Figure 11 - Twitter page

3.5.2 Traditional media

The second method consisted of contacting directly music professionals and specialized media with the objective to capture the industry's attention. Press releases in Portuguese, English and Spanish were sent to institutions like Mashable[40], Pitchfork[41], Wired[42], Uncut[43], Público[44] and others to present Musikki's concept and objectives.

This is slow process and, until now, there have not been any direct results of these contacts. Nonetheless, the team continues to send press releases with objective of increasing notoriety levels.

3.5.3 Awards and Competitions

Applying for relevant awards and competitions might be a way to gather media attention. For this reason, the team decide to apply for two innovation and

[40] See http://mashable.com/
[41] See http://pitchfork.com/
[42] See http://www.wired.com/
[43] See http://www.uncut.co.uk/
[44] See http://www.publico.pt/

creativity awards. At a national level, Musikki entered the Zon Multimedia Award[45] 2010 but, unfortunately, did not made it through to the final phase. The team then decided to run for the South By Southwest Interactive Awards 2011[46], Austin, Texas, United States of America. The results of this competition are yet unknown and are scheduled to be release in late January 2011.

3.6 Brand recognition and notoriety

An interesting phenomenon happened in these early stages of the project's life cycle, recognition came not has a direct result of the promotional efforts presented in previous chapter, but by initiative of unknown individuals in the online community. By analysing Google Alerts'[47] daily reports, which recorded 105 posts on blogs and websites about Musikki (by January 11), the key point for the brand's exposure was the nomination as "Mashup of the day"[48] by the mashup specialized website Programmable Web on the 22nd of December of 2010. Consequently, Musikki has been referred and reviewed in several blogs and websites, such as *Killer Start Up*[49] and *What's New*[50], and even on a Greek newspaper[51], which might have contributed to the 3931 visits and 10100 page views from its launch on November 5, 2010 and January 9, 2011

[45] See http://www.zon.pt/Premio/
[46] See http://sxsw.com/interactive/awards
[47] See http://www.google.pt/alerts
[48] See http://www.programmableweb.com/mashup/musikki/popnew
[49] See http://www.killerstartups.com/Search/musikki-com-a-new-music-search-engine
[50] See http://br.wwwhatsnew.com/2011/01/musikki-encontre-tudo-relacionado-a-seus-artistas-favoritos/
[51] See the PDF version of the newspaper available at http://www.enet.gr/?i=issue.el.home&date=29/12/2010&s=www&c=ellada

4 Data presentation and Analysis

The website usage data analysis and online questionnaires were the chosen methods to evaluate the proposed mashup model. The online community gathered during the first two months of Musikki beta, as well as the author's own friends network, was used to invite web users to participate in the surveys. Google Analytics[52], a free service provided by Google, was used to track the site usage, while Facebook's built in analytics was used to keep track of the interactions on the project's fan page. Another Google service, Google Alerts, was also used to monitor the mentions of the term "musikki" on websites and blogs.

4.1 Questionnaire - Music listening habits and music browsing

As mentioned before, Musikki's networking community (Facebook and Twitter) and the author's network was used to invite users to participate in these surveys. Participants were also asked to share the survey's link to their own private networks that might have led to contributions outside the two referred networks and to the total of 157 participants.

A Google Docs[53] form was used to publish and register data of the online survey. The graphics from the same web application are used in the following data presentation and analysis.

[52] see www.google.com/analytics
[53] see htttp://docs.google.com

4.1.1 Participants Profile

In this survey, there was a higher percentage of male participants (male 62% and female 38%) and most of the participants were in the age group of 18 to 35 years old (83%) (Chart 3) The predominance of this age group might have two causes: i) the universe of the sample – the author's social network was used to share the online survey. Most of his friends are on this age range so it was a likely result; ii) technological literacy – as mentioned in the target audience topic, it was expected that most of the users of the application were on the range of 13 to 44 years old.

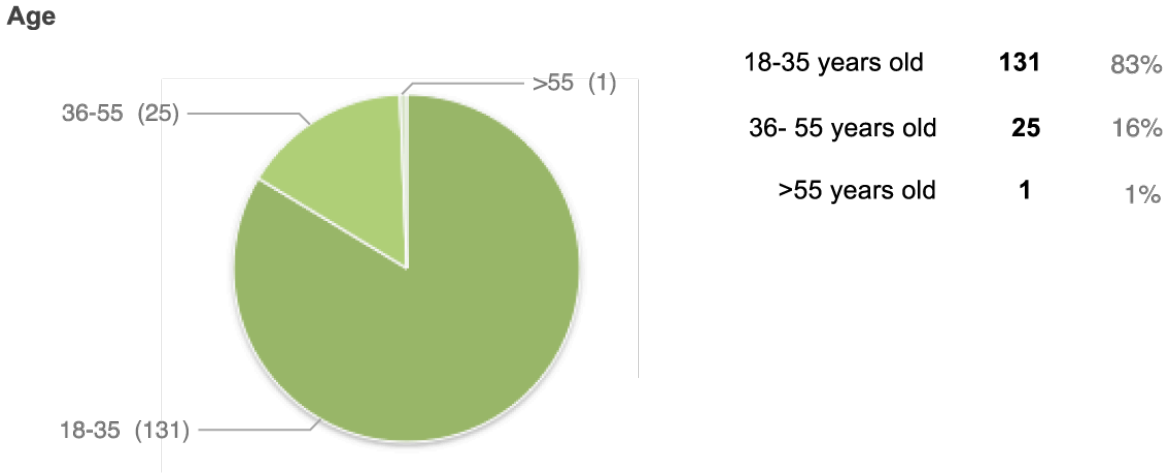

Chart 3 - Participants by age

4.1.2 Listening Habits

Everyone who likes music is a possible user of applications such as Musikki or Urock. Therefore, there were no restrictions to participants with lower music consumption habits. However, the author believes that the definition of the participants' music consumption profile is still mandatory. A person that listens to a lot of music and regularly uses music related services might give a more inside opinion about the use of such a mashup service. For this reason, a group of questions that addresses music listening habits was included in this survey.

Every participant stated that they listen to music, with 89% referring that they listen more than one hour per day and only 1% says that they rarely listen (Chart 4).

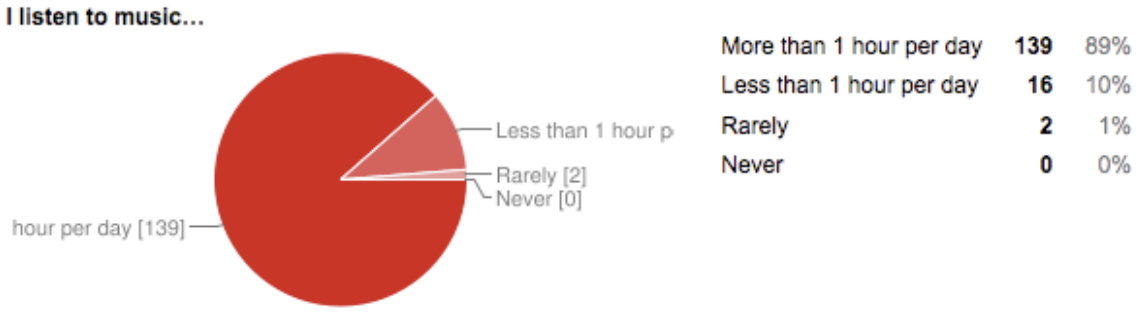

Chart 4 - Music listening time per day

People listen mostly music at home (92%), in the car (88%), at work (75%) and while walking or jogging (50%)(Chart 5). With these numbers it is no surprise that the mediums most used to listen to music are the computer, MP3 player, radio or CD player (Chart 6).

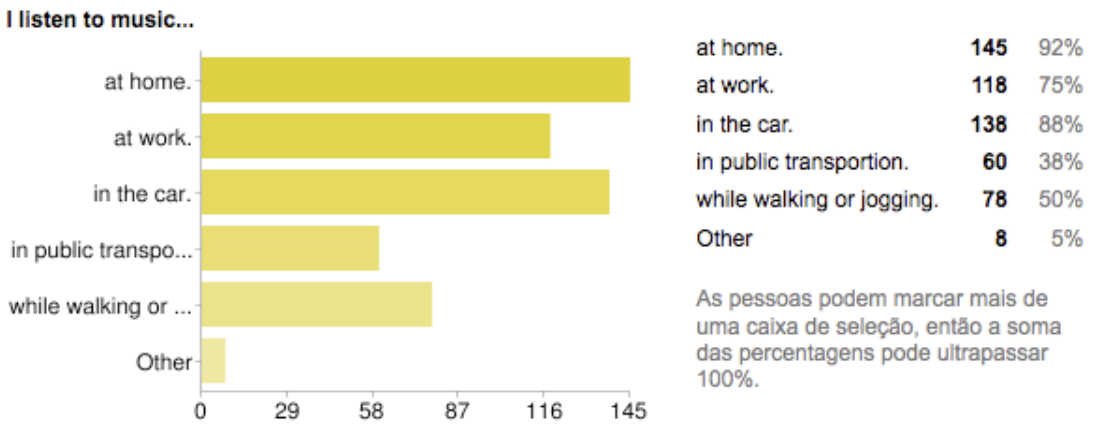

Chart 5 Music listening habits by place

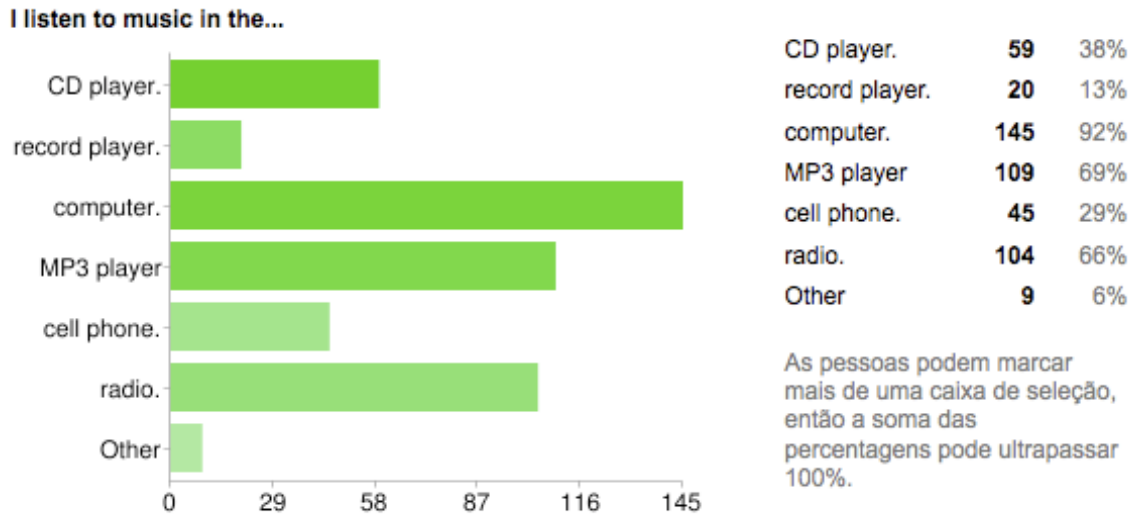

Chart 6 - Listening habits by medium

Although everyone that participated listened to music only 33% buy music on a regular basis, 12% of which buy more than an album per month (Chart 7). The habit of individual digital songs seems that it is not rooted in the Portuguese population (only 3% of the participants are not Portuguese).

These are important figures for projects like Musikki or Urock, whose business models also rely on indirect sales. This seems to indicate that companies can only count on approximately 36% of the website traffic as possible music buyers.

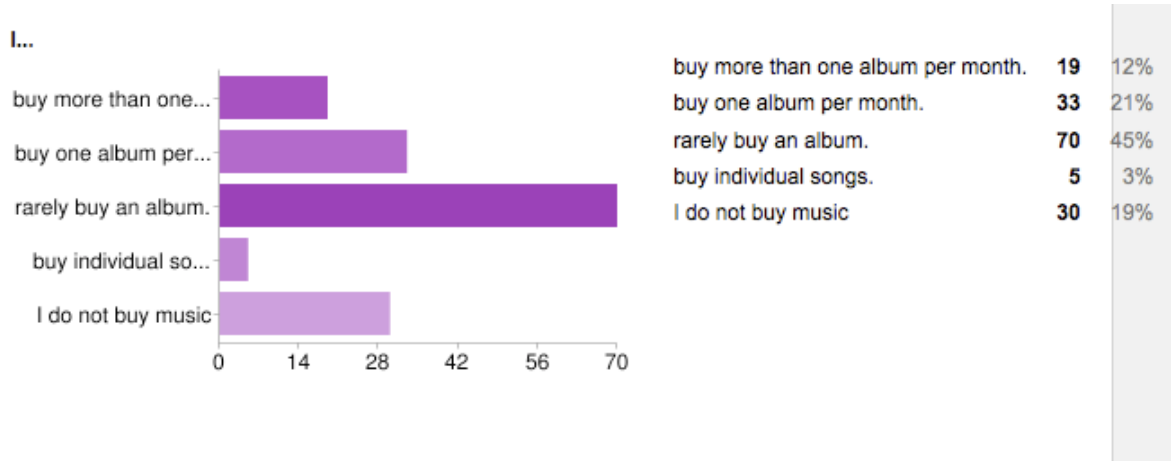

Chart 7 - Music buying habits

CD is still the most bought format, followed by digital (ex. MP3) and DVD. Although recently regaining importance, vinyl is the less bout format. When it comes to the places where they buy music, they apparently buy in all three major types of vendors: traditional record stores (59%); online stores (54%); big retailers (52%).

Again this might be interpreted as a good indicator when the revenue model is concerned. The fact the costumers buy online almost as much as in physical stores shows there is a good chance that indirect sales might work.

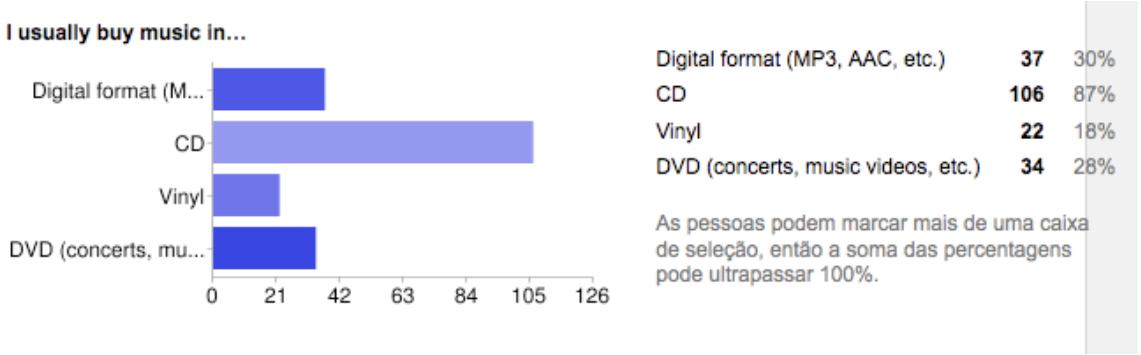

Chart 8 - Buying habits by format

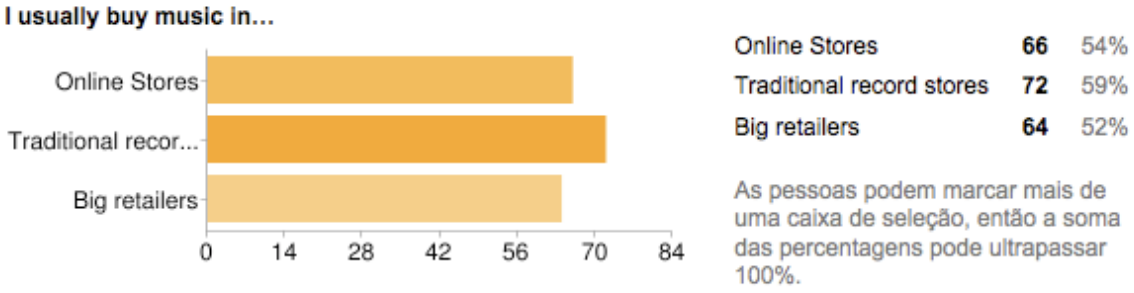

Chart 9 - Buying habits by vendor type

One of this surveys objectives is to determine which are the preferable information and service sources. For this reason, it is important to identify the most used online stores in order to determine which API will feed the "buy this album" functionality.

Amazon, the API included in the tested model, is the most used online store (41%) (Chart 10) and iTunes (25%) the second most. Ebay is also featured in the top three with a 12% usage. Participants that have chosen the "Others" option have referred other services. However, the number of repeated occurrences is very low with Fnac[54], Spotify, Play.com[55], CDWow[56], artist's official website and label's home page being the most mentioned with only two references.

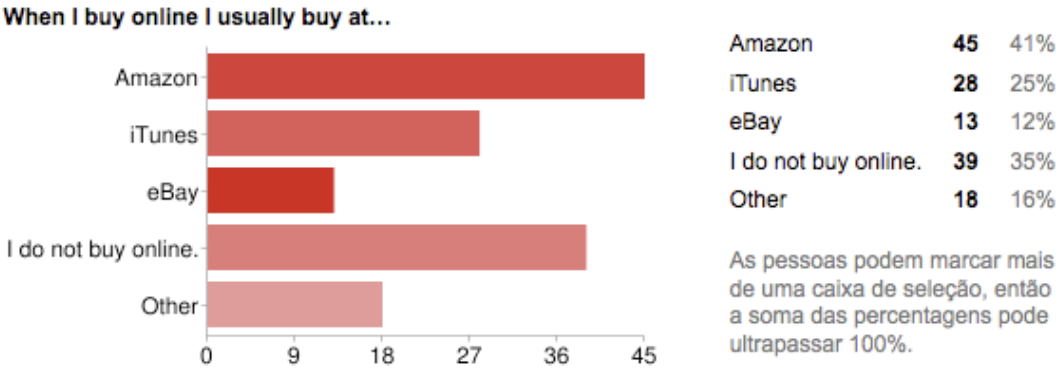

Chart 10 - Online stores

[54] see http://fnac.com/
[55] see http://www.play.com/
[56] see http://www.cdwow.com/

4.1.3 Music browsing

This section of the questionnaire aims to understand the users' habits of music browsing and their receptivity to use a service like Musikki. Although Musikki serves in this research to validate the proposed mashup model, this set of questions will allow inferring if those who have not used it would have interest in such a service.

Of all the participants, 69% prefer to use a general search engine such as Google to find music artist related information. The second most used is Wikipedia, used by 50 % of the users, followed by Myspace (39%) and Lastfm (40%) with almost the same share of use. It is interesting to see that the All Music[57] guide is not one of the most used, although it is probably the most detailed repositories when music is concerned (Chart 11).

The participants could chose more than one option and the high percentage of Google answers might indicate that many have chosen Google and the second destination they normally select (e.g. search on Google and then chose on Wikipedia result). For future work, it would be interesting to try to confirm this idea.

[57] see http://www.allmusic.com/

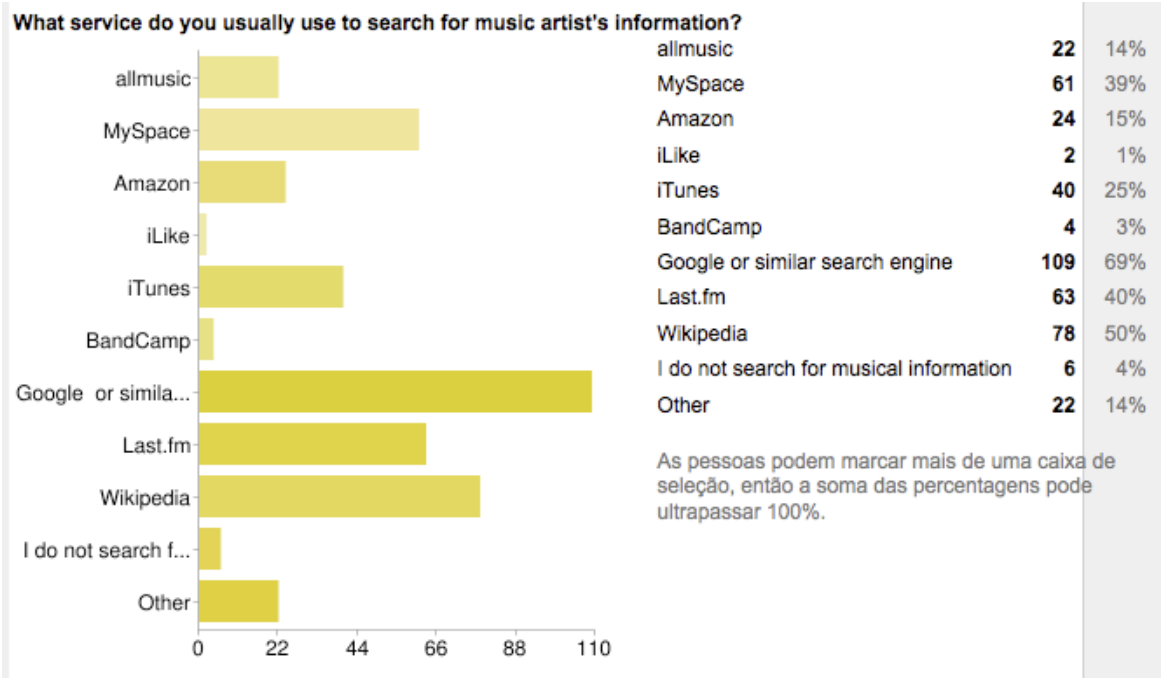

Chart 11 - Music search services

YouTube is by far the most used service to listen to music on the Web with 82% followed by Last.fm (39%) and MySpace (38%). It is interesting to see that MySpace and Last.fm almost maintain the same results of the previous question, which might suggest that users who use a service for one goal (find info) use the same for other functions, as long as the service provides it.

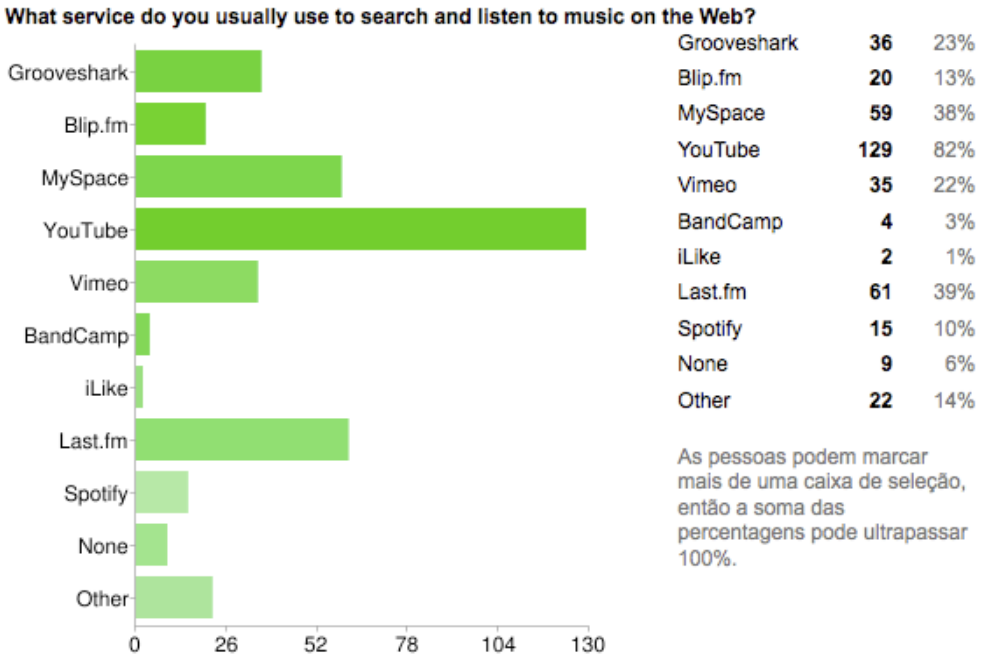

Chart 12 - Music listening services

When it comes to search for concert related information, the respondents seem to prefer to use the artist's website (55%) while 34% go directly to the vendor's website (e.g. ticketmaster). Myspace (28%) and Lastfm (23%) are again on the top four of the most used services.

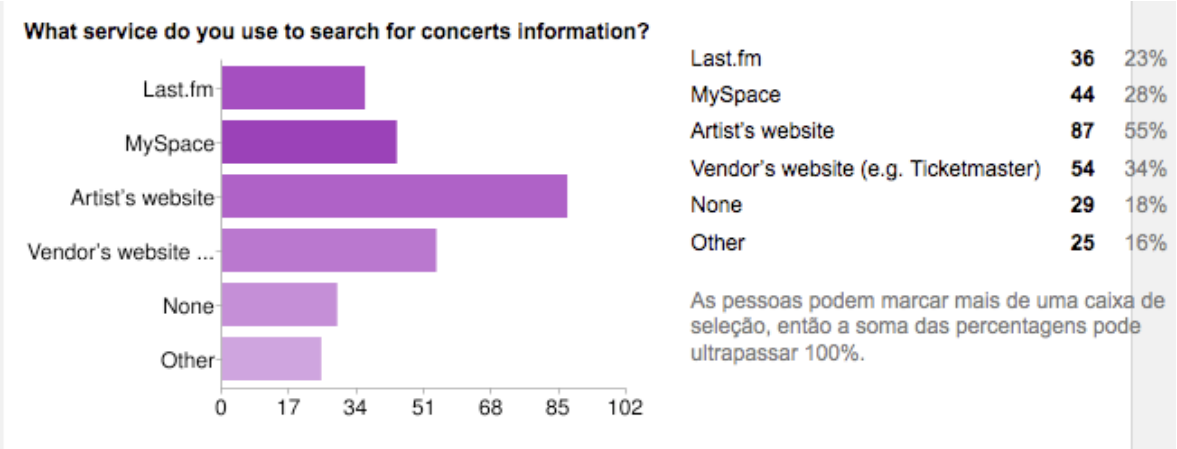

Chart 13 - Concert information

Songs are the number one music searched content (93%) seconded by videos (69%), discography (63%) and lyrics (59%). It is interesting to see that lyrics is

more searched than concert information, which a good indication on the improvements that can be made to model, when it comes to new functionalities.

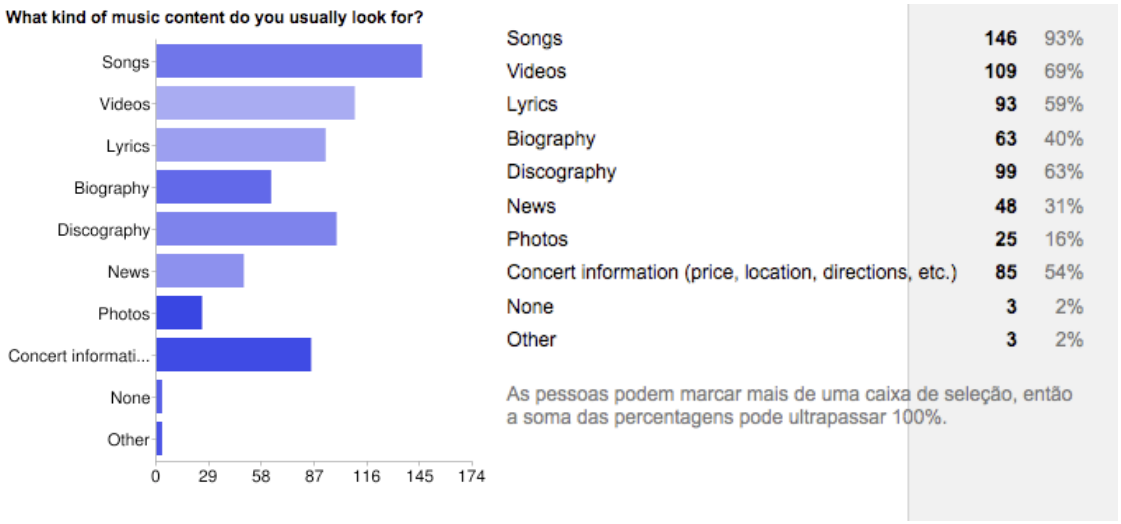

Chart 14 - Searched music content

When asked if they would use a website that aggregates some of these services, instead of using a specific service for each purpose, 85% stated that they would use such a service. This is an important information because justifies the existing of a service such as Musikki or Urock.

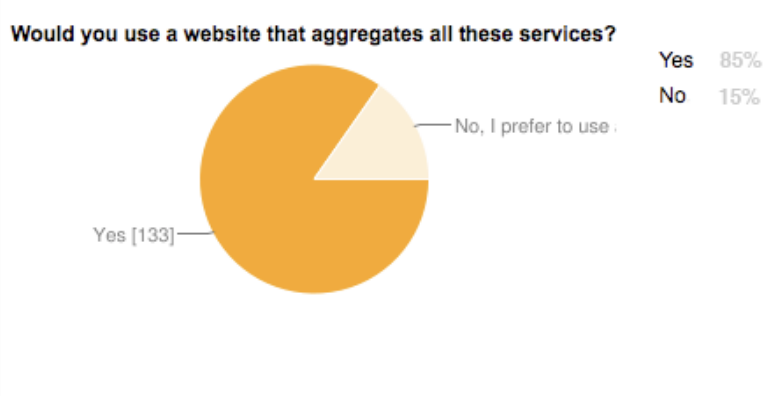

Chart 15 - Aggregated services

4.1.4 Musikki

This section addresses the actual use of Musikki an its objective is to evaluate the effectiveness of the service.

Most of the participants did not used Musikki until that day (66%) which makes the positive answers of the previous question even more interesting, because they indicate an intention of use before knowing about the service.

After this point in the questionnaire, participants that had never used Musikki could have ended their participation, nonetheless some users visited the website, tested the service and continued their participation (53 respondents had never used but 100 answered the final question).

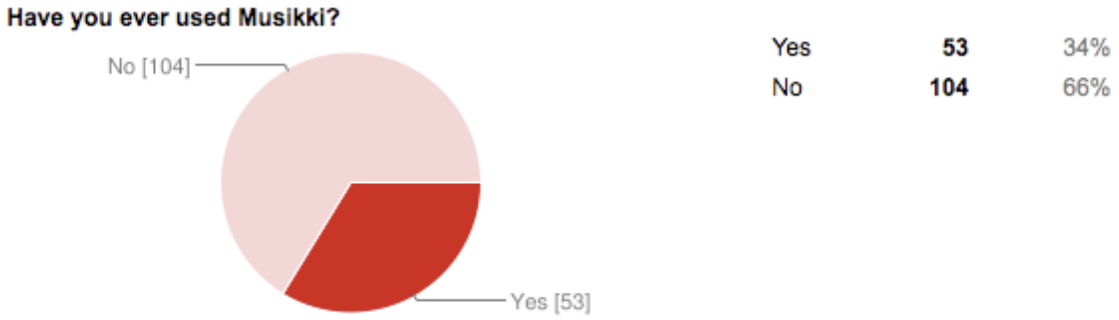

Chart 16 - Musikki usage

The majority of the participants, 96% (all the answers between levels 3 and 5 were considered), gave positive feedback about the utility of this service and 43% even find it very useful. This might indicate that the mashup is serving its purposes.

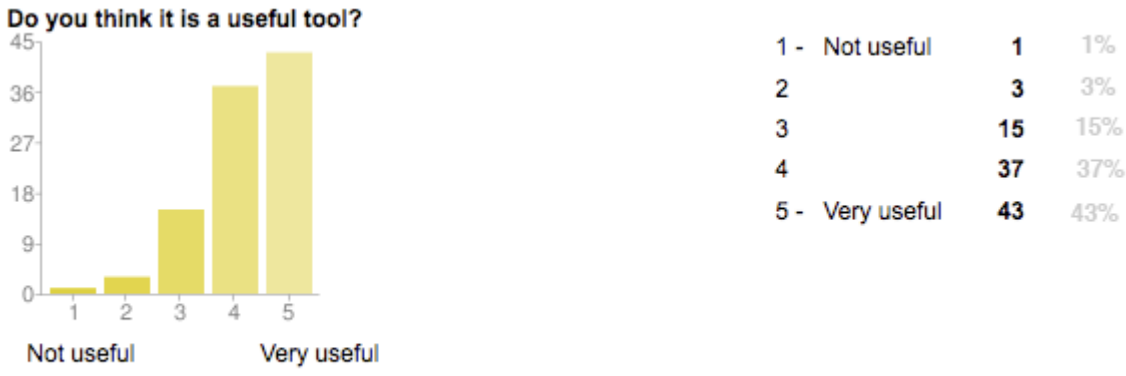

Chart 17 - Musikki satisfaction

One of the purposes of this questionnaire was to understand what could be improved in the mashups model. According to the participants, links to the artist's official pages (58%), music player (49%), lyrics (45%) and YouTube video playlist (42%) are missing functionalities that could really add something to this application.

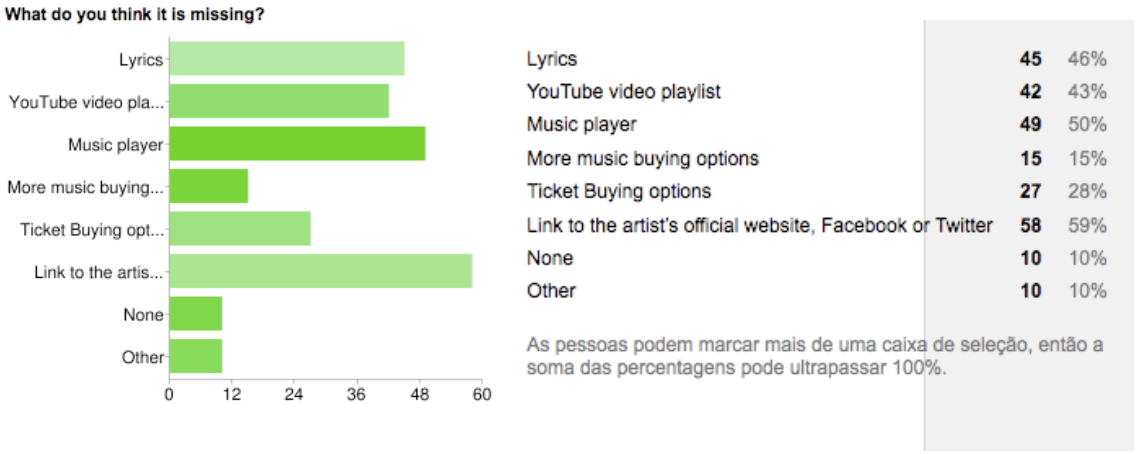

Chart 18 - Missing content

The layout structure and the way information is presented pleases the majority of users that answered the survey. Only 13% do not like the way information is presented.

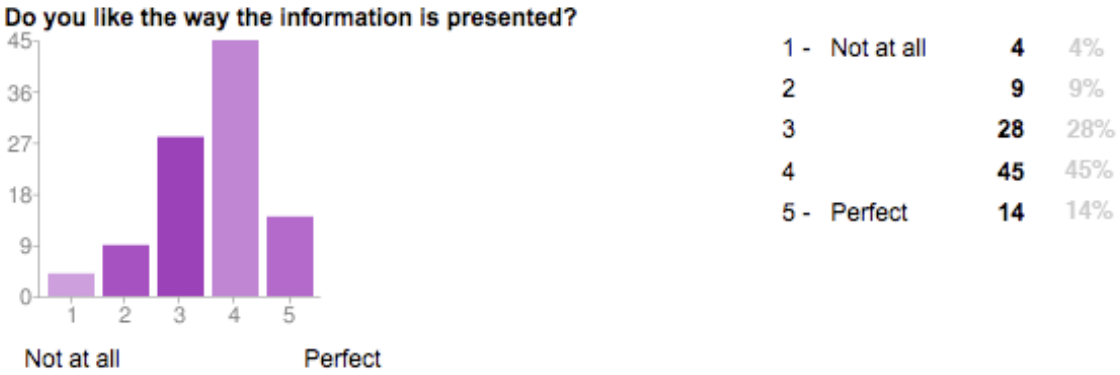

Chart 19 - Musikki's layout

4.1.5 Improvements and suggestions

An optional open question concluded the questionnaire. Participants were asked if they had any suggestion to improve Musikki and 33 of them accepted the challenge. They focused on three main subjects:

i) design and interaction – it is the most addressed subject by the participants. They make several suggestions like a brand redesign, layout arrangements, use "read more" option on text fields and show/hide content blocks;
ii) search results – problems with the accuracy of the search results were reported as well as some error messages in some of the content blocks API requests (e.g. Flickr photos);
iii) system performance – at least 4 of the participants state that the search process is very slow. The testing of the system performance was not one of the research objectives. However, it is an issue that should be addressed by the Musikki and Urock development team because a pour system performance might lead the user to stop using the service no matter how god the concept is

The information gathered in this survey is of the utmost importance to the evaluation and redefinition of the mashups model. A comprehensive reflexion on the issues raised is presented in the conclusions chapter where a new mashup model is also addressed.

4.2 Google Analytics

As previously mentioned, the Google Analytics tool was used to gather site usage data such as unique visitors, page views, traffic sources, users' countries, average time on site and top content, among other things. Understanding how visitors use and arrive to the website is highly important. It allows the development team to improve the website and to decide were to focus their attention when it comes to referral sources.

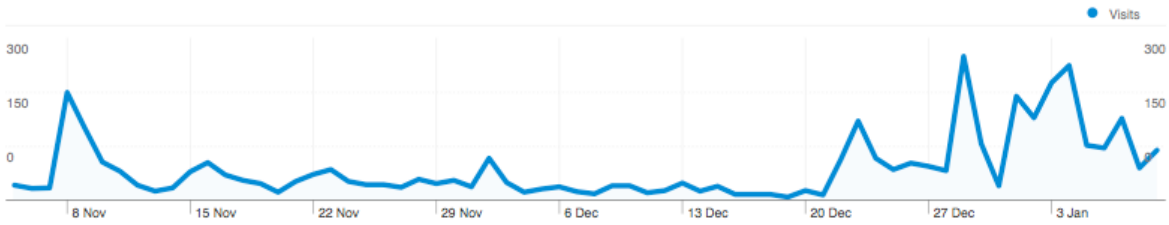

Chart 20 - Musikki unique visitors from 5 Nov. 2010 and 9 Jan. 2011

From November 5th 2010, the day it was launched, and January 9th 2011, 2723 people from 76 countries visited Musikki. Some of these visitors returned (3931 visits) but there are a high percentage of new visits (68%), which might be explained by the website's short active period (it has only been active for approximately 2 months). These visits produced a total of 10100 page views, which results in an average of 2,6 pages per visit. The time spent on the website is an average of 3 minutes and 2 seconds. This is probably related to the YouTube video featured in the result page (the average length of a music video is 3 minutes and 10 seconds) and it would be interesting to verify if, by offering, for example, a video playlist, the time spent increases.

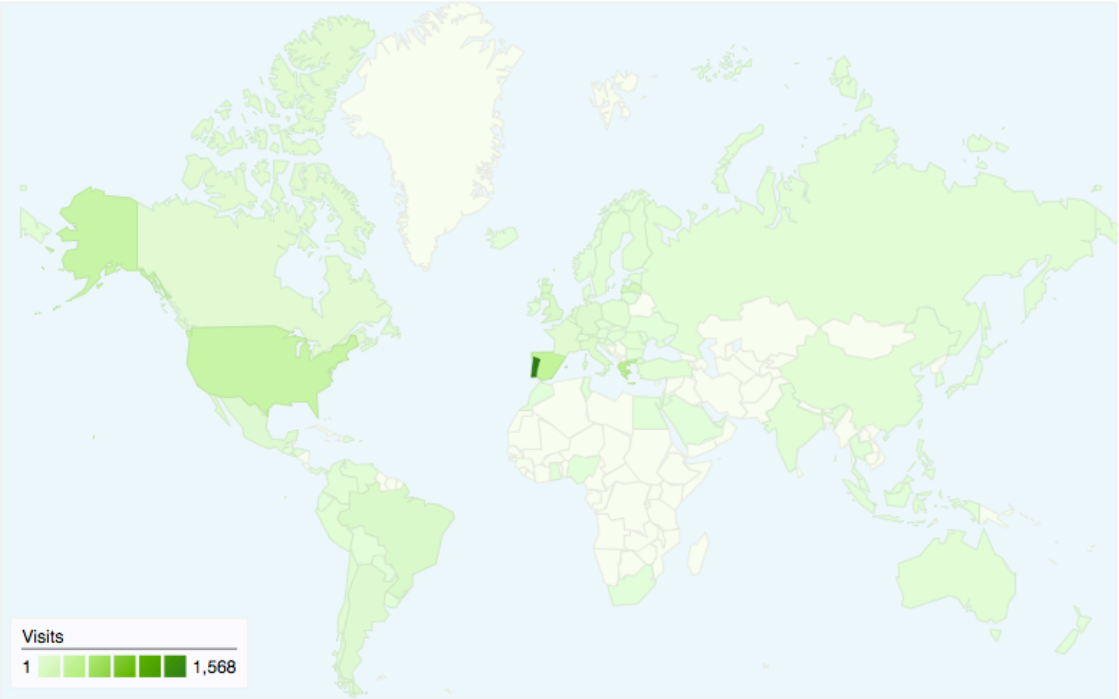

Chart 21 - Musikki visitors by country

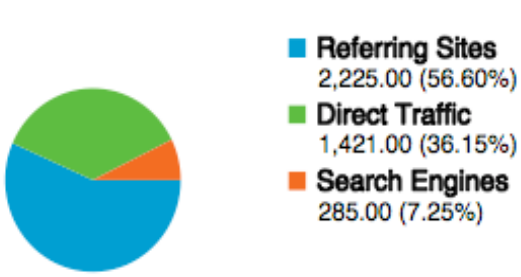

Chart 22 - Traffic sources

Portugal contributed with approximately 40% of the visitors followed by Greece (13,4%), Spain (8,9%) and the United States (7,2%) (see Appendix 6 for more information). The reason why Portugal is the first country on the list is probably related to the author's influence networks, which consist mainly of Portuguese connections. The author's Twitter and Facebook accounts were used to promote the project in the early stages, so it is faire to assume that his and nearby networks were the main source of traffic. In fact, the traffic sources report shows that 56,6% off the traffic comes referring sites (2225 visits) with Facebook (31,1%) and Twitter (11,4%) being the most used in this category (Appendix 6). The influence of Facebook in the number of Portuguese visits can also be confirmed by the percentage of Portuguese fans of Musikki's Facebook page, 87% (Appendix 7) of the of 177 fans by January 7.

4.3 Facebook

By January 7, 2010, Musikki's fan page had 177 fans, 18477 post views and 143 post feedbacks (i.e. likes, comments and shares).

As mentioned before, Facebook is one of Musikki's main traffic sources. The online marketing strategies, used to promote the project, could be contributing to this phenomenon. The next table shows that the posts with more impressions are related to the "Artistit of the day" (AOD) initiative (6 posts in the top 10) (see 3.5.1).

Stream Posts[?]

Message	Posted	Impressions ▼	Feedback
Artist of the day... Twin Shadow	03 January at 15:33	565	0.53%
Artist of the day... Best Coast	Thursday at 16:26	550	0.55%
Artist of the day... alcoholic faith mission	22 December 2010 at 12:00	549	0.91%
Artist of the day... Beach House	28 December 2010 at 15:18	543	1.7%
Musikki featured @ Programmableweb And don't forget to vote!	22 December 2010 at 16:31	523	0.57%
Artist of the day... French Kicks	29 December 2010 at 15:00	521	0.77%
Musikki featured @ Listio Don't forget to vote ;)	28 December 2010 at 16:30	514	0.78%
Artist of the day... Black Mountain	04 January at 14:01	501	0%
Musikki reviewed at KillerStartups.com	29 December 2010 at 17:15	468	0.85%
Musikki featured on Startup Ranking! Don't forget to vote! ;)	04 January at 13:52	445	0.90%

Table 8 - Most viewed Facebook posts

However, more impressions did not result in more feedback. In fact, when the same table is ordered by post's feedback the results are inverse (3 AOD posts in the top 10). The next Chart shows the high diference between post views and feedback (likes, comments and wall posts). Although it seems that the posts may not be engaging enough, this might be related to the type of posts shared, external links. There are studies about the effectiness of Facebook posts by type of content (Vitrue, 2010) but they only address embedded content (i.e. text, image and video). For future work it would be interesting to understant how do Facebook users act when they are redirected to an external link. It might happen that they simple do not go back to Facebook page to click the "Like" button and this would

explain why low feedback rate on the posts results on a high rate of traffic source[58].

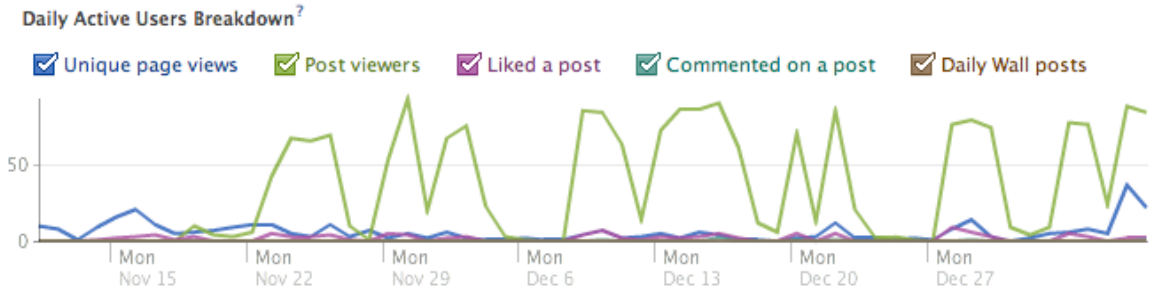

Chart 23 - Interactions by viewed posts

4.4 Google Alerts

This tool was used to keep track of website and blog posts that used the trend "musikki". Googlebot[59] registered 105 posts about Musikki from November 9, 2010 and January 11, 2011. The posts that, in the author's opinion, were more relevant were shared on Musikki's presence on social networks with the intention to generate extra traffic to the website.

Figure 12 - Google Alerts

By comparing these records with Google Analytics' reports it was possible to identify the reasons behind the Website visit peaks. For example, it was possible to determine that was the nomination as "mashup of the day" on the website Programmable Web that resulted in a traffic increase after December 22, 2010.

[58] For all Facebook analytics data see Appendix 7
[59] See http://en.wikipedia.org/wiki/Googlebot

5 Model Improvements

The results of the questionnaires revealed that the model proposed in the beginning of this study could serve its purposes. However, they also raised issues that need to be properly addressed. For this reason, a new version of the model was conceptualized.

This new version addresses several issues that were identified during the testing period:

i) Content and functionalities – there seems to be a problem with content related to less known artists. Last.fm is the primary source API and it builds its database based on what the users listen to, which might leave out bands that have no published material. There is also a problem when, even known bands, have their media content in platforms not included in the model (e.g. videos on Vimeo), which leaves voids of information on the profile page;

ii) Interface design and interaction – as mentioned in the open question section, some artists have more information than others, which makes it virtually impossible to determine the size of some content areas (e.g. biography text field). The height of some of the result pages, forced the user to scroll down several times to get to the bottom content;

iii) System performance – the slow response of the search system is the most mentioned issue. This might be happening because the service makes a first call to the Last.fm API to get basic information and name correction and only then makes a second call to all the other APIs;

5.1 Waves of Mashups

Based on the analysis of the data retrieved with this comprehensive study and on the experience gained while developing this model, the author conceptualized a new version of the mashup model that can be applied to both projects (Musikki and Urock).

The first proposal consisted of one API per content area and if the queried results were null or the service failed, an error message was prompt and only areas with content were displayed. The author believes that a possible solution to this problem might be the implementation of a logic that he defines as waves of mashups. A sequence of requests to APIs, that offers the same type of content, in a predefined order. For example, to retrieve the artist's music a first call is made to the YouTube Data API and if there are no results or the connection failed, a second call is made the Vimeo API and if that also fails a third one is made to the BandCamp API.

The core process stays the same; a first request to an API with general information about the artist is made (e.g. name correction, biography, band members, etc.) followed by a second request to several APIs at the same time to retrieve specific content (e.g. videos, discography, etc). The reason why two separate requests are required is because the second one uses information gathered in the first to make the call. The information is sent as parameters with the objective of refining the search results. As an example, the artist's name and the name of his most listened song on Last.fm are sent in the request to the YouTube Data API to retrieve a specific song video.

In the new version of the model the difference is that there will be three possibilities for each request (see Figure 13).

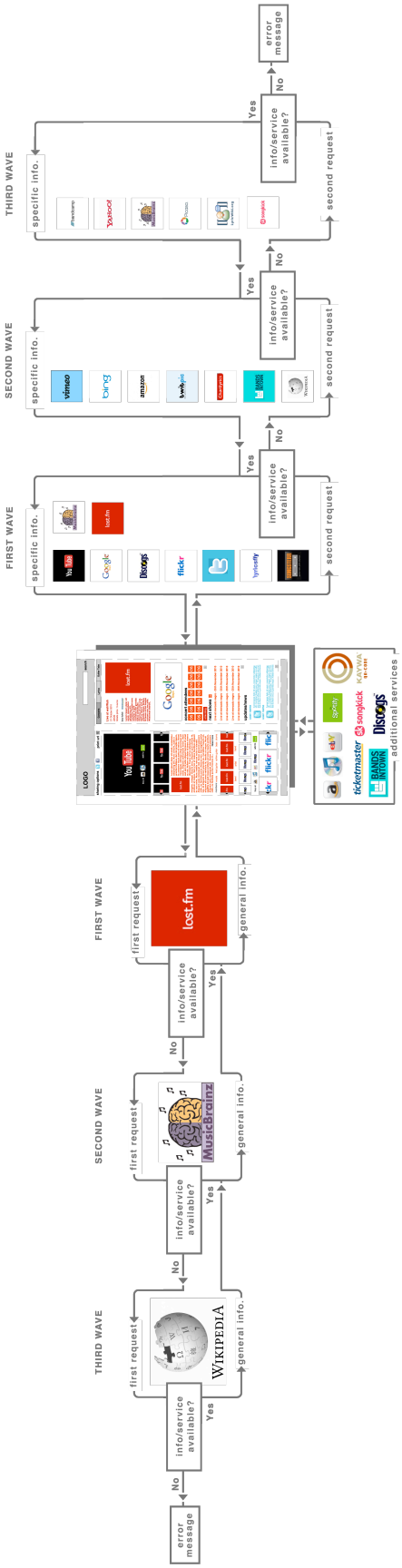

Figure 13 - Improved mashup model

First request (general information):

1. Last.fm;
2. MusicBrainz;
3. Wikipedia.

Second request (specific content):

1. Last.fm, YouTube, Google Map, Discogs, Flickr, Twitter, LyricsFly, Songsterr and MusicBrainz;
2. Vimeo, Bing Maps, Amazon, Twitpic, Chartlyrics, Bands In Town and Wikipedia;
3. BandCamp, Yahoo, MusicBrainz, Picasa, LyricWiki and Songkick.

The criteria used to distribute the APIs, was that each wave (i.e. group) could generate one entire result page with minor exceptions (news update and guitar tabs). Although they were organized in groups they can be access separately. If only one API of a requested wave is missing, the system just calls the similar API in the second wave (e.g. if Flickr has no photos it only calls Twitpic).

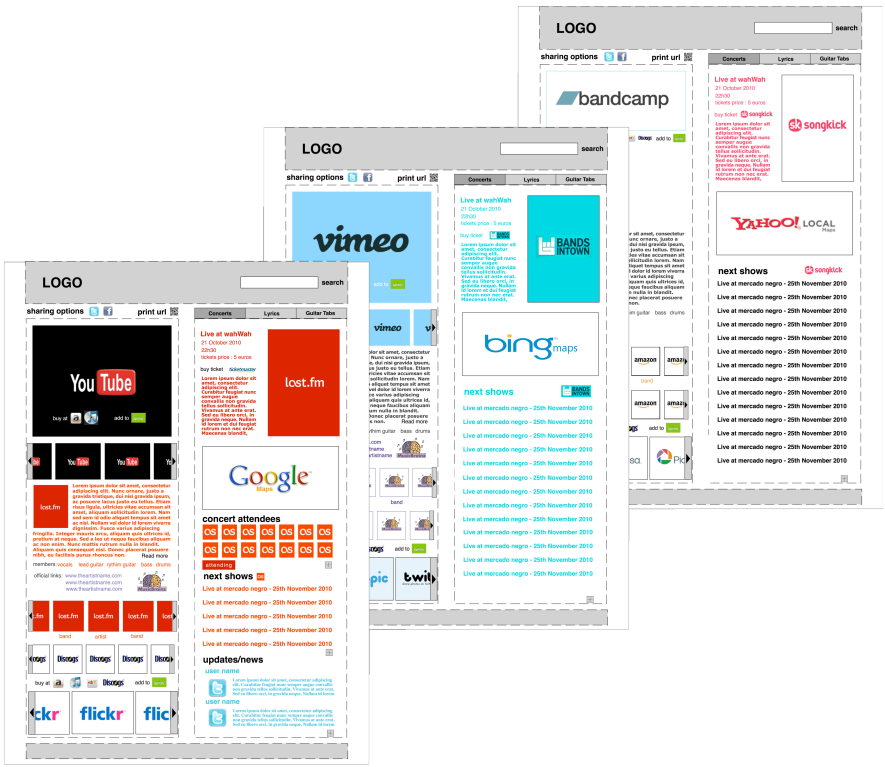

Figure 14 - Improved model in layout mode

There is another group of requests (identified as “additional services” in the model) that are not included in the search algorithm. They are the APIs that feed the “buy”, “add to playlist” and “print this link” options and they are only called when the user clicks on the related buttons. The reason why it was decided to leave these functions out of the search algorithm was to prevent the process from becoming even slower.

Although this model might present as a solution to the identified problem of study, it still has two issues that deserve attention: i) gaps in the model – there are two content types that have only one resource provider, news update (Twitter) and guitar tabs (Songsterr); ii) unsigned bands - most of music repositories are based on published material only (e.g. all music guide), which leaves out artist that have no work published, yet, from the search results.

The author is aware that these issues might reduce the possibilities of success of the conceptualized model. In order to prevent this, he proposes the following actions as possible solutions:

i) Encourage content providers to open their Web Services – establish direct contact with websites that own the missing media content and suggest them to offer such a service. Online magazines such as Pitchfork[60] already offer RSS feeds of their news articles but if a Web Service was provided it would allow a seamless integration in this model;

ii) Urock registering mechanism and public API – The studied model aims to facilitate the adherence of music artists to the new social network by allowing populating their profiles with existing information. However, Urock will also feature a common registering system where users can create their profiles from the beginning. Therefore, the less known artists will still be able to sign to Urock and by doing so they will be contributing to fill the missing gaps of information. Urock will share this new information through its own public API, which will eventually feed other mashup applications such as Musikki.

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[60] See http://pitchfork.com/

5.2 Improved Functionalities

In this topic, only the changes to the functionalities are addressed. For a detailed description see the functionalities topic on the concept presentation section.

Video Player

The new version of the player will feature three major changes:

i) Custom player – the actual embed YouTube player will be replace with the chromeless version available through the YouTube Player API[61], which will allow a full player customization thus enabling the addition of new player options (e.g. "buy this song");

ii) Video playlist – a YouTube/Vimeo video playlist of the 10 top listened songs on Last.fm. The Last.fm API is used to retrieve the songs list and the YouTube data API is called to get the video for each song;

iii) Buy and "add to playlist" options – an option to buy the songs featured on the playlist through digital download on Amazon and iTunes. Another planned feature is the option to add songs to the user's Spotify playlists. This option will only be available when the Spotify playlist API[62] is fully operational on GitHub and to users that access the service in Spotify authorized countries.

[61] see http://code.google.com/intl/pt-PT/apis/youtube/getting_started.html#player_apis
[62] see https://github.com/spotify/playlist-api

Biography

The analysis of the Google Analytics' GeoMapReport (see Appendix 6) reveals that Musikki was visited by users in 76 different countries. While the language report (see Appendix 6) shows that they speak 55 different languages. The search returns, by default, the biography in English but with the introduction of a geolocation system it will be possible to infer the users' language by relation to his current location. Therefore, as long as it is available, the biography will be retrieved in the users' language. However, it might be the case that the user wishes to read in different language or that he is not accessing from his country of birth. For this reason, an option to change the biography's language will be added to this area.

Similar and related artists

The existing functionality retrieves only the name of the related artists. In this new version, it will also display the artist's profile picture with the objective of making this functionality more appealing to the user.

Next Concert

The actual version of the functionality displays the next concert by chronological order. This new version will take advantage of a *geolocation*[63] system (see 5.3) to present the next concert near the user's actual location. Another add-on to this feature will be the possibility to buy tickets to the presented concert through Ticketmaster[64] and Bands In Town[65]. Like in the buy music option, this will contribute to both projects (Musikki and Urock) revenue models because a percentage of future sails revert to the referral website.

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[63] see http://en.wikipedia.org/wiki/Geolocation
[64] see http://labs.buy.at/tm.php
[65] see http://www.bandsintown.com/api/affiliate_program

Concerts Agenda

In this new version, the user will be able to click on the concert from the agenda to see the full details. This description will appear on the top of the concerts column, substituting the content of the next concert area. The title of the area will also be update to "Concert details".

Discography

The changes in this functionality will affect only the buying options. In the current version, the only option available is through Amazon's online store based on the United States[66]. The improvements will consist of the following features:

i) Discogs as main API – although Amazon is one the biggest online stores, their music catalogue seems incomplete when it comes to less known artists. From all the music APIs analysed, Discogs is the one that offers the most complete catalogue. For this reason, Discogs will be the primary API.

ii) More buying options – user will be able to chose to buy from Amazon, iTunes, eBay and Discogs;

iii) Relevant Amazon store – using the IP geolocation system, if the user choses to buy the album through Amazon he will be redirected to the most relevant Amazon store, according to his location (e.g. if the user is in Portugal he will be redirected to the United Kingdom store[67]);

iv) Spotify integration – as mentioned before, the integration with Spotify will only be available when the public playlist API is fully operational. Nonetheless, the option of an "add to playlist" feature is already planned for future versions of the model. This option will only be available to users that access this service in Spotify authorized country.

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[66] see http://www.amazon.com/
[67] see http://www.amazon.co.uk/

5.3 New Functionalities

Most of the new functionalities were conceptualized in response to issues raise on the questionnaires and analytics' analyses. However, the experience on mashup development gained while working on Musikki, also contributed to the idealization of some of these new features.

Lyrics

Lyrics are one of the most searched music related contents (see Chart 14). For this reason a song lyrics functionality will be added to the new model. The new feature will use primarily the Lyrics Fly API[68] to display the lyrics of the song selected on the video player. The same information that was used to query the YouTube Data API (artist name and song title) will be used on the request to the information from the Lyrics' API.

This new add-on to the mashup model will force an adjustment on the page layout. In this new version, a tab menu will be added to the second column (i.e. concert information), which will allow the user to switch from "concert information" to "song lyrics" or "guitar tabs".

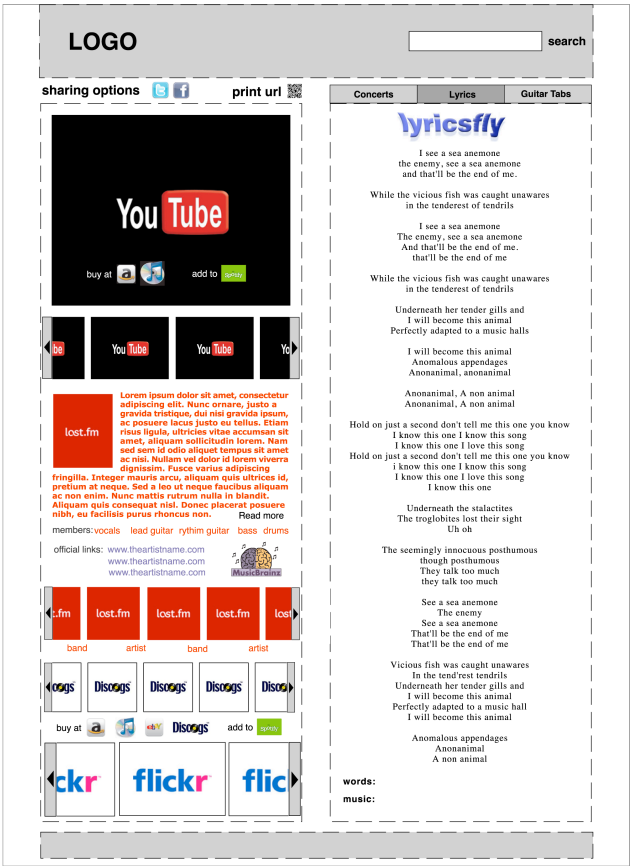

Figure 15 - Lyrics Layout

[68] see http://lyricsfly.com/api/

Guitar Tabs

The Songsterr API [69] will be accessed to present the guitar chords of the song selected on the video player. As in the Lyrics case, the guitar tab will occupy the entire second column, which means he can follow the song's video on the left (first column) and the guitar tabs on the right.

Although this type of content was not mentioned by any of the participants in the questionnaire, the author considers that this might be an interesting new feature. The real interest in this functionality will have to be confirmed on further studies.

Figure 16 - Guitar tabs layout

Band Members

The band members are normally described in the biography text, however the author believes that the availability of a highlighted list of the band members might be useful for a quick reference. This information can be obtained through the Last.fm, Wikipedia and MusicBrainz.

Geolocation

An IP based geolocation service, already successfully implemented on the development version of the site, will allow determining the geographic location of

[69] see http://www.songsterr.com/a/wa/api

the user. Some of the existing functionalities will benefit from this new add-on (next concert, biography, amazon buying option and add to Spotify playlist option).

Printable Link

In the tested model, there was already a connection between the physical world and digital information (e.g. venue location on Google Maps), which would fit the concept of "information shadow", referred by Tim O'Riley and John Battelle. However, there are other tangible objects, commonly used in the music universe, that have not been address, yet. Concert poster, flyers and other printed material are still used in the promotion of music events or album releases and, in the author's opinion, a functionality that would allow to quickly view the mentioned artist's profile on the Web could be useful.

Initially, the focus of this research was on music and social media related APIs but, as the study evolved, it became clear to the author that other APIs could also be integrated. A good example is KAYWA's QR Code API[70] that allows generating a QR Code[71] of a given URL. With the advent of this technology it is possible to access a Web address from a printed document by means of a QR Code application reader (e.g. BeeTagg[72]) installed on a smartphone[73].

The new version will feature a "print this link" button on the top of page, next to the sharing options. When clicked, it opens a pop-up window with an image composed by the Musikki/Urock's logo, the QR Code returned by the API, the text "Use QR Code Reader to learn about…" and a "save" button (Figure 17). The user can save the image to his local hard drive and then use it on any printable documents. This will allow, for example, Designers to rapidly add a link to the artist's profile on a concert poster.

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[70] see http://api.qrcode.kaywa.com/services/api/
[71] see http://en.wikipedia.org/wiki/QR_Code
[72] see http://www.beetagg.com/
[73] see http://en.wikipedia.org/wiki/Smartphone

Figure 17 - Screenshot of the "Print this link" option with a working QR Code.

5.4 Interface Design and Interaction

The following revisions address the above reported issues that concern design and interaction.

Extendable content blocks

Content blocks that require a vertical organization of the content (e.g. biography, concerts agenda, concert attendees and Twitter feed) will be contained in horizontal extendable fields. A “read more” or “+” option will allow the user to extend the content block and view the full content.

Horizontal Navigation

Content based on images (photos, discography, recommended artists and video playlist) will feature horizontal navigation (Figure 15).

Tabs organization

As mentioned above, more functionalities and content will be added to the layout and model. This causes greater problems on what layout organization is concerned. Therefore a system of tab navigation, on the second content column, will allow a different space distribution (Figure 16). The tab *concerts* will be active by default and the user will be able to switch to lyrics and *guitar tabs*.

5.5 System Performance

The loading time of the result page was reported excessive by some of the participants in the questionnaires. This is a key issue for the success of the mashup model. Although it was not measured in this study, it is fair to assume that sending requests to all the APIs, included in this model, and processing the retrieved information requires some time. Internet users are now used to fast loading pages and faced with a service that takes a bit longer to respond might lead them to stop using the service at all.

The author proposes two new features that might minimize the slow response issue:

i) Loading status feedback – implementing preloaders that give feedback of what is happening in the process. This feedback should address several steps in the process. As an example, the full loading sequence could consist of the following status feedback (ordered chronologically):
   - "searching artist basic information, please wait";
   - "1 match found, retrieving basic information";
   - "building a customised page for you, please wait";

ii) Memory cache – Musikki's Google Analytics content report (Appendix 6) shows there is a possibility that the same artist will be searched, in the same period of time, by different users. A memory cache system like Memcache PHP module[74] will allow storing a searched artist profile page for a determinate period of time. This way, if the same artist is searched again, it will not be necessary to repeat the requests sequence procedure and the page would automatically load. Most of the content provided does not require constant update (biography, videos, concert dates, etc.) so a one-day validation period, for each cached page, would be possible. However, special attention is required for the Twitter feed because it

[74] see http://www.php.net/manual/en/intro.memcache.php

requires constant updates. An *on load event* or similar with be necessary to guarantee that Twitter's information is up-to-date even on cached pages.

6 Conclusions

6.1 Reflection

The purpose of this research was to understand if it would be possible to build a music artist profile based on mashup technology. Nowadays, music artists have their web presence dispersed. They have their media content in different locations such as YouTube, Last.fm, Wikipedia, Flickr, Vimeo, iTunes or MySpace, for example. This might present as an obstacle when it comes to decide if they want to register on a new music platform like Urock. The need to create a new profile from the beginning and upload new content might discourage them to do so. This research aimed to respond to this problem by using mashup technology to retrieve that scattered media content.

The results of the evaluation period indicate that the concept of a mashup based music artist profile can be an effective solution. Unfortunately it was not possible to test it with Urock but the evaluation period with Musikki allowed to understand what kind of content users expect to see on a musician profile and to confirm that it is possible to build a dynamic profile based solely on mashups. Another outcome of these tests was the indicators on how to organize so many content from so many different sources in single web page.

The initial version of the mashup model had positive feedback. Considering that the newest version will feature several enhancements, which are based on the results of the testing period, it is expected that it will result on an improved model at the end.

The main limitation of this model is that some of the artists, that have no published work, are not found on the search results. However, the author believes that this is another point where this study can make a contribution to this area of expertise. This conclusion might encourage websites to open their APIs and others to improve the content provided so they can also play their part in this model.

One of the most relevant outcomes of this research is that it may contribute directly to the improvement of two products. Urock will have its unique user-generated artist profile that can be populated with one click and that is always up-to-date. Musikki, that was used to study the model, will benefit from the same outcomes of this research and hopefully become a better music search engine at the end.

6.2 Study Limitations

The main constraint to this study was time. In order to reach a final conclusion, a few more months were required to develop the second version of the model and evaluate it with Musikki and then apply it on the Urock platform. Unfortunately, there are restrictions imposed by the deadlines of the master degree program that must be followed. The fact that the author is a working student also contributed to these time constraints.

Another limitation was the inexperience of the author in developing with mashup technologies. A future work in this project could benefit from the contribution of someone with proficiency in this area of expertise.

6.3 Future work

The implementation and evaluation of the new mashup model is the next planned step. In the author's opinion, this new model should continue to be tested with Musikki, until a stable version is achieved, before implementing in the Urock application.

Urock is a cross-platform application and this model was tested on a web-based application only. In order to be fully adopted by Urock, further studies should be carried out to understand how the model is affected by different platforms

6.4 Final remarks

While writing the final chapters of this dissertation, developments came up that, in the author's opinion, are worthy of mention. On January 26, 2011, two of the most

important news blogs posted two favourable reviews [75] [76] about Musikki. Hypebote [77], a music and technology blog, and Mashable [78], a news blog specialized on social media that was ranked 240 on the Alexa's chart[79] by January 27, 2011. These mentions resulted on a huge increase on the site unique daily visits, which went from 133 on January 25 to 1365 visitors on January 26, 2011.

[75] See http://www.hypebot.com/hypebot/2011/01/musikki-your-new-music-search-engine.html#more
[76] See http://mashable.com/2011/01/26/musikki/
[77] See http://www.hypebot.com/
[78] http://mashable.com/
[79] See http://www.alexa.com/siteinfo/mashable.com#

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Appendix

Due to the proportions of some of the documents, it was decided to provide them on a digital format for better readability. These documents were organized in folders and are presented in the following pages.

Appendix 1

In order to retrieve data for the Theoretical Framework Chapter several systematic analysis addressing mashups and API were conducted, which resulted in large amounts of data.

These contents can be accessed on the folder "*Appendix 1 Theoretical Framework Tables"*, include in the DVD appended to this dissertation.

Appendix 2

Screenshots of the Urock cross-platform layouts.

These contents can be accessed on the folder “*Appendix 2 - Urock Screen Shots”*, included in the DVD appended to this dissertation.

Appendix 3

Images from the mashup model schemes in its original size.

These contents can be accessed on the folder "*Appendix 3 - Mashup Model Images"*, include in the DVD appended to this dissertation.

Appendix 4

Musikki's screenshots in its original size.

These contents can be accessed on the folder "*Appendix 4 - Musikki Screen Shots"*, include in the DVD appended to this dissertation.

Appendix 5

Questionnaires questions, data and charts.

These contents can be accessed on the folder "*Appendix 5 -Questionnaire"*, include in the DVD appended to this dissertation.

Appendix 6

Google Analytics reports.

These contents can be accessed on the folder "*Appendix 6 - Google Analytics Charts"*, include in the DVD appended to this dissertation.

Appendix 7

Facebook's analytics screenshots.

These contents can be accessed on the folder "*Appendix 7 - Facebook Charts and Tables*," include in the DVD appended to this dissertation.

Appendix 8

Official versus fan videos (YouTube).

These contents can be accessed on the folder "*Appendix 8 - Appendix 8 - YouTube videos analysis*", include in the DVD appended to this dissertation.